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The Celestial River: Identifying the Ancient Egyptian Constellations

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The Celestial River: Identifying the Ancient Egyptian Constellations

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Abstract

WHILE the descriptions of many of the Greek constellations found in the works of Eudoxus (366 BC) and in *The Phaenomena* of Aratus (275 BC) may have originated from an Assyrian source circa 1100 BC (Schaeffer, 2006), many of the Greek constellations do not have a clear Mesopotamian precedent (Rogers, 1998b). They may have been created around 2800 BC (± 300 years) (Ovenden, 1966) by a culture of “navigators” that could determine the cardinal directions by observing the circumpolar constellations (Rogers, 1998b). Due to the paucity of reliable astronomical data on the constellations of ancient Egypt (V. L. Davis), there is no consensus on their identity (DeYoung, 2000). This paper proposes that a new opportunity has arisen for deciphering the ancient Egyptian night sky, based on parallels between the iconography of the list of *nomes*, or administrative districts of Egypt, and the classical constellations visible in Egypt circa 3100 BC.

This astronomical study of the night sky in ancient Egypt, using modern software (Voyager, 2009), demonstrates that the emblems of the districts of Upper and Lower Egypt represented ancient constellations that were rising, setting, or culminating in sequence (table 1). The “emblem constellations” indicate that the ancient Egyptians possessed early representations of many of the classical constellations known to the Greeks, such as Leo ; Scorpius ; Aquila, the eagle ; the water-bearer, Aquarius ; Taurus ; Orion ; the dog of Canis Major ; and

Lepus, the rabbit . The analysis of the emblems of Upper and Lower Egypt enabled a hypothetical identification of 36 ancient Egyptian constellations (table 2). Furthermore, 28 out of the 38 Egyptian constellations are nearly identical matches, both astronomically and iconographically, when compared to the Ptolemaic list of 48 classical Greek constellations. Major new interpretations for the Egyptian circumpolar constellations are also proposed.







Methodology


Why was Osiris worshipped at Abydos, Hatmehit, the fish goddess, worshipped at Mendes, or the ram-headed Amun worshipped at Thebes? Is there an explanation for the location of these cult centers in specific ancient Egyptian cities? Could the Egyptians have laid out their kingdom according to a divine principle, a "Nile in the sky" where terrestrial localities had cosmic equivalents?

Research of the sacred geography of ancient Egypt has focussed primarily on the celestial alignments of temples and royal tombs with the cardinal directions, solstices, and heliacal risings of important stars (Haack, 1984) (Clagett, 1995) (Spence, 2000) (Shaltout & Belmonte, 2005). The work of talented astronomers and Egyptologists in the last 60 years since Neugebauer and Parker (1960), has been hampered by a lack of clear archaeoastronomical evidence, thereby relying on scarce astronomical texts and imagery such as those present in the interior lids of sarcophagi from the First Intermediate Period and astronomical ceilings of the New Kingdom.

In 1916, the French archaeologist George Daressy theorized that the 22 nomes of Upper Egypt had astrological and planetary alignments on a grand scale (Daressy, 1916). Without astronomy software that could recreate the night sky for any given location and period of history, he was unable to precisely analyze the rising and setting constellations as seen by an ancient Egyptian observer. To test Daressy's hypothesis it was necessary to recreate the night sky of ancient Egypt. This analysis uses astronomy software set to the year 3100 BC and the coordinates of Memphis (30.57° N), capital of a unified Egypt during the Old Kingdom. Although the nomes were clearly defined by the 5th dynasty (Morkot, 2005), they can be traced back to the predynastic period of 3100 BC, when they first appeared (Najovits, 2003). While this early date does not prove that the constellations were invented in ancient Egypt (in fact, they may be prehistoric), it demonstrates that the emblems were an early and complete

list of the classical constellations, which falls within the estimates provided by Ovenden for their creation (2800 BC, \pm 300 years).

While previous studies, such as those by Lull and Belmonte, have proposed that the ancient Egyptians possessed almost entirely unique constellations, perhaps with the exception of Leo, the "divine lion," known as *mꜣt*  in New Kingdom astronomical ceilings (Lull & Belmonte, 2006), this paper proposes that they had many of the same constellations that were known to the Greeks. One clear example is the constellation of the eagle, Aquila, which is symbolized in the name of four different districts with various representations of the falcon: Upper Egyptian 5th  and 18th , Lower Egyptian 3rd  and 20th . These nomes represent the specific times when Aquila rises, sets, and is in its upper culmination. The most logical explanation is that the Egyptians also had the Aquila constellation, which the Babylonians called Aquila, ^{MUL}Á.MUSHEN , the "eagle."









While there is no specific mention of emblem constellations in the limited trove of Egyptian astronomical texts, this does not necessarily preclude their existence, especially since many of the emblems symbolized the gods themselves (e.g., the Hare  was symbolic of the rabbit goddess Unet) who are present in Egyptian art and literature. Also, literary proof that the ancient Egyptians associated the terrestrial Nile with a celestial Nile is supported by the Ptolemaic-era "Book of the Faiyum," a mythologized map of the Faiyum region, where deities are paired with their cult centers and specific localities are linked with cosmic equivalents (Tait, 2003). This notion is reaffirmed by a hymn to the sun disk Aten, from the 18th dynasty pharaoh, Akhenaten, which makes reference to a "Nile in the sky": "For you have set a Nile in the sky, that it may descend for them, and make waves upon the mountains like the sea" (Simpson, 1973). Not only did the ancient Egyptians align their temples to important stars, but perhaps they followed a guiding principle when drawing the boundaries of the districts and establishing the cult centers of the Egyptian pantheon, and thereby creating the Nile in the image of the heavens.









Confirming the celestial locations of the districts are the annual religious festivals (Schott, 1950) and the Cairo Calendar Papyrus of lucky and unlucky days (Bakir, 1966) that celebrated particular deities and mythological events. Christian Leitz was the first to propose that the Cairo Calendar Papyrus contained astronomical data, while Hardy proposed that it was a star almanac (Hardy, 2003). More recently, a statistical analysis has revealed that the lucky and unlucky days









correspond to the synodic month and possibly even the variation of brightness of the star Algol (Porceddu, Jetsu, Markkanen, & Toivari-Viitala, 2008). Following Porceddu et al., the astronomical calculations for the Cairo Calendar Papyrus are set to the year 1224 BC.








Summarizing the methodology: first, the study compares the names of the districts with the constellations visible on the horizon or in upper culmination positions in ancient Egypt, looking for obvious iconographic and symbolic parallels with the classical constellations. Second, the analysis groups nomes with similar iconography (e.g., falcons, water jars, lions, etc...) to determine if they represent the same constellation but in different celestial positions, such as setting or rising. Third, the paper finds philological or literary evidence for these constellations, in Egyptian, Greek, and Babylonian sources, and also looks at early Arab names for some of the stars (aṣ-Ṣūfī, 1874). Fourth, the research finds parallels between the patron gods and major cult centers of the nomes with the associated constellations. Fifth, the paper complements this with an astrotheological analysis of artistic representations in various sources, from the Book of the Dead to Ptolemaic era zodiacs. Finally, the study confirms the celestial placements of the nomes with the festivals and events defined in the Cairo Calendar Papyrus and other sources.


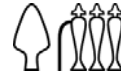


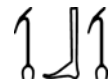

Table 1: Nome Constellations. The nomes of Egypt, with associated stars and constellations from 3100 BC calculated with the latitude of Memphis. Abbreviations: R = Rising, S= Setting, UC = Upper Culmination, and LC = Lower Culmination.

Lower Egypt					Upper Egypt			
	Nome	Emblem	Stars	Constellation	Nome	Emblem	Stars	Constellation
Leo	20 <i>spd</i>		<ul style="list-style-type: none">• Sirius CMa R• Leo R• Altair Aql S	Aquila, Leo				
	19 <i>imt-ph</i>		<ul style="list-style-type: none">• E, Z Hercules S• Leo R	Leo, Hercules	14 <i>ndft-ph</i>		<ul style="list-style-type: none">• Regulus Leo R• Algol Perseus UC	Leo, Perseus, Hydra
	18 <i>imt-hnt</i> (Per-Bast)		<ul style="list-style-type: none">• Hydor Aqu S (Rises w/ Crater)• Leo tail R	Aquarius	13 <i>ndft-hntt</i> (Lycopolis)		<ul style="list-style-type: none">• Alphard Hya R• Hydor Aqu S• Perseus UC• Aludra CMa R	Hydra “water snake”, Aquarius
Virgo	17 <i>sm3-bhdt</i>							
	16 <i>h3t-mhit</i> (Mendes)		<ul style="list-style-type: none">• Pisces S• Deneb Kaitos S• Lyre R	Pisces	12 <i>3tft</i>			

Lower Egypt				Upper Egypt				
Nome	Emblem	Stars	Constellation	Nome	Emblem	Stars	Constellation	
15 <i>dhwti</i>		<ul style="list-style-type: none">• Albireo Cyg S	Cygnus “swan”					
14 <i>hnti-i3bti</i>		<ul style="list-style-type: none">• Crater R (sets with Aquarius LC)	Crater “water bowl”	11 <i>s3</i>		<ul style="list-style-type: none">• Muphrid Boo R• Sagittarius LC• Scheat Pegasus S “the foreleg”	Boötes, Pegasus	
Libra	13 <i>hk3-ndw</i> (Heliopolis)		<ul style="list-style-type: none">• aCrux R• Opp Aries	Centaurus	10 <i>w3dyt</i>		<ul style="list-style-type: none">• Eltanin Dra S• Unukalhai Serpentis R• Hydra UC	Draco
Scorpio	12 <i>tb-ntr</i>		<ul style="list-style-type: none">• Dschubba R• Taurus S	Taurus	9 <i>mnw</i> (Panopolis - Perseus worshipped)		<ul style="list-style-type: none">• Pleiades S• Perseus S• Ophiucus R	
	11 <i>hsbw</i>		<ul style="list-style-type: none">• Al Niyat/Antares?• Taurus S• Leo MH (lion god Mahes worshipped)	Taurus				

Lower Egypt				Upper Egypt			
Nome	Emblem	Stars	Constellation	Nome	Emblem	Stars	Constellation
10 <i>km-wr</i>		<ul style="list-style-type: none"> • Al Niyat? • Taurus S 	Taurus				
9 <i>'ndti</i> (Busiris)		<ul style="list-style-type: none"> • Orion R, • Errai Cep S • "shephard" • Cebalrai Ophi R • "Shepherd's dog" 	Orion	8 <i>t3-wr</i> (Abydos)		<ul style="list-style-type: none"> • Corvus UC when Orion sets 	Corvus
8 <i>hwi-i3bti</i>							
7 <i>hwi-imnti</i>							
Sagittarius 6 <i>h3sww</i>		<ul style="list-style-type: none"> • Corona Australis R • (Sets opp Taurus) 	Corona Australis, Taurus	7 <i>b3t</i>		<ul style="list-style-type: none"> • Lyre R • Virgo UC • Sag "teapot" R 	Lyre
				6 <i>ikr</i>		<ul style="list-style-type: none"> • Alkaid UMa UC • Alya Serpens Cauda R 	Ursa Major

Lower Egypt				Upper Egypt			
Nome	Emblem	Stars	Constellation	Nome	Emblem	Stars	Constellation
5 <i>nrt-mḥtt</i>		<ul style="list-style-type: none"> • Sham Sgr R • Spica Vir UC • Gomeisa CMi S • Aspidiske Car S 	Sagitta “arrow” Aspidiske “shield”				
4 <i>nrt-rst</i>		<ul style="list-style-type: none"> • dSgr R • Procyon S • Aspidiske Car S 	Sagitta “arrow” Aspidiske “shield”				
3 <i>imntt</i>		<ul style="list-style-type: none"> • Altair Aql R • Virgo MH (Hathor worshipped) 	Aquila	5 <i>ntrwi</i>		<ul style="list-style-type: none"> • Tarazed Aql R • Pollux Gemini S 	Aquila “eagle,” Gemini “twins”
Capricorn 2 <i>ḥpš</i>		<ul style="list-style-type: none"> • Arcturus UC • Algedi Secunda Cap R 	Boötes	22 <i>mdnit</i> (<i>ḥpš</i> = scimitar)		<ul style="list-style-type: none"> • Delphinus R • Cancer S 	Delphinus
				4 <i>w^cst</i> (Amun worship)		<ul style="list-style-type: none"> • Algedi Secunda Cap R • Aries LC • Rigil Centaurus UC 	Aries

Lower Egypt				Upper Egypt				
Nome	Emblem	Stars	Constellation	Nome	Emblem	Stars	Constellation	
				21 <i>nꜣrt-pḥt</i>		<ul style="list-style-type: none">• Ras Elased Leo S• Deneb Algiedi• Cap R• Thuban LC	Leo, Perseus	
Aquarius				20 <i>nꜣrt-ḥntt</i> Heracleo-polis		<ul style="list-style-type: none">• Skat Aqu R• When Aquarius S, Perseus UC	Aquarius “water-bearer”	
	1 <i>inbw-ḥd</i> “White Wall”		<ul style="list-style-type: none">• Markab Peg R• Tabit Orion UC when Sets	Square of Pegasus	3 <i>nḥn</i>		<ul style="list-style-type: none">• Pisces Circlet R	Pisces Circlet
Pisces				19 <i>wꜣbwy</i> Oxyrynchus (Fish)		<ul style="list-style-type: none">• a and b Centauri S		
Aries				18 <i>nmti</i>		<ul style="list-style-type: none">• Sheratan Aries R• Aquila UC• Canis Major LC	Aquila “eagle”	













































Lower Egypt				Upper Egypt			
Nome	Emblem	Stars	Constellation	Nome	Emblem	Stars	Constellation
				2 <i>wṯs-ḥr</i>		<ul style="list-style-type: none"> • Ara S • Perseus R • Spica Vir S (nxbt cult) • When Aries S, Cassiopeia S 	Ara “temple”
				17 <i>inpwt</i> (Cynopolis - Anubis woship)		<ul style="list-style-type: none"> • Edasich UC “hyena” • Hamal Aries R • Sirius R when Hamal UC • Lupus S 	Canis Major, Lupus
Taurus				16 <i>m3-ḥd</i>		<ul style="list-style-type: none"> • Al Anz Aur R “the goat” • Muphrid Böo S 	Auriga “the kids”
Gemini				1 <i>t3-sti</i>		<ul style="list-style-type: none"> • Gemini R • Tabit/Pi5 Ori R • Sagittarius S” 	Sagittarius “archer,” Orion “hunter”
Cancer				15 <i>wnt</i>		<ul style="list-style-type: none"> • Arneb Lep R • CMi R 	Lepus “rabbit”

Table 2: Ptolemy's Constellations with Egyptian Parallels. Ptolemy's classical constellations alongside the proposed constellations from ancient Egypt. Bolded constellation names indicate exact iconographic matches between the Egyptian emblem and the Greek constellation.

Greek	Egyptian	Alt.
Andromeda		
Aquarius		
Aquila		
Ara "throne of horus"		
Argo Navis		
Aries <i>mnit</i> mooring post and/or sceptre		
Auriga		
Boötes		
Cancer		
Canis Major		

Greek	Egyptian	Alt.
Canis Minor		
Capricornus "under the tail of the goat"		
Cassiopeia ¹		
Centaurus	?	
Cepheus		
Cetus		
Corona Australis		
Corona Borealis		
Corvus		
Crater		
Cygnus ²		
Delphinus		
Draco		
Equuleus		


Greek	Egyptian	Alt.
Eridanus ³		
Gemini		
Hercules "kneeler"		
Hydra ⁴		
Leo		
Lepus		
Libra		
Lupus		
Lyra Sistrum, also a fish		
Ophiuchus ⁵		
Orion		
Pegasus		
Perseus "tree"		

Greek	Egyptian	Alt.
Pisces circlet, while twisted flax or chain is knot of pisces		
Piscis Austrinus		
Sagitta		
Sagittarius		
Scorpius		
Serpens		
Taurus		
Triangulum ⁶		
Ursa Major		
Ursa Minor		
Virgo		








Notes to Table 2:



- ^{1.} Cassiopeia closely resembles the shape of the "throne of horus" hieroglyph present in the emblem of the second Upper Egyptian Nome. Unlike the Greeks who saw Cassiopeia as a sitting queen, the Babylonians saw Cassiopeia as the Stag, ^{MUL}LU.LIM, perhaps emblematic of

the horns of the animal. Like the bear of Ursa Major, this association of Cassiopeia spread to several cultures around the world. The Quileute tribe of North America saw this constellation as the "Giant Elk Skin." The Sami saw it as elk antlers, and the Chuchkee of Siberia saw the stars as five reindeers. According to La Lande, quoting from Firmicus and the Egyptian sphere of Petosiris, there was a *cerf* "deer" constellation north of Pisces, while Bayer had the name *cerva* for Cassiopeia. Cassiopeia sets with Aries, the ram, and with the star in Draco, Altais, the Arabic "goat" (from more southerly latitudes such as Thebes). It is also in its lower culmination with Aries, when the head of Capricorn is rising. However, it is too early to confirm that, like the Babylonians, the Egyptians also saw Cassiopeia as the horns of a goat.

2. Wainwright argued that Cygnus was the falcon-headed god Anu, *ʿnw*, (Wainwright, 1932) which is highly unlikely given that the falcon was clearly the Aquila constellation. The ibis nome corresponds to the setting of Cygnus, and it matches iconographically with the Greek swan. In fact, the Daressy zodiac represented the ibis with the sign of Aquarius because Cygnus sets along with the water-bearer.
3. The Ramesside Star Charts reference "the stars of the water," which is probably Alphard Hydrae. However, during the New Kingdom, when Alphard rose, Acamar was in its upper culmination, and when it set, it was in its lower culmination. The star Acamar, "river's end," of Eridanus, rises with Sirius, from the Southernmost longitude of Egypt at Abu Simbel circa 3100 BC. Sirius heralded the rising of the River Nile. It is in its upper culmination, when Aquarius rises.
4. Hydra, the water serpent, could be emblematic of the horned viper with the water jars depicted in the nome emblems.
5. The capital of the ninth nome of Lower Egypt, which corresponded to Orion setting and Scorpius and Ophiucus, the serpent holder, rising, was called Busiris by the Greeks, or *ḳḏwt*  by the Egyptians, written with the hieroglyphs of a hand holding a serpent.
6. Triangulum is in its upper culmination when Sirius rises. The star Alsciakaut, Arabic for "thorn," was in its upper culmination with Triangulum. The name *spdt* for Sirius means "thorn."

I. The Emblem Constellations

Archaeologists found the world's oldest astronomical stone circle in Nabta, Egypt, in an area that is now desert but once contained a lake used by early pastoralists (McKim Malville, Schild, & Wendorf, 2008). Large stones delineate a circle with four "windows," which align with the summer solstice and the North and South poles. Possible alignments to Arcturus, Sirius, Orion, and Ursa Major have been proposed, indicating that these constellation were sighted as far back as 4500 BC. The Egyptians continued to align their monuments and temples to the stars, perhaps using a plumb line and constellations such as Ursa Minor and Ursa Major to pinpoint north (Gingerich, 2000). It is no coincidence that the Egyptian word for "star" *sbꜣ*   is also the name for the plumb line surveying instrument *sbꜣ*   . To the Egyptians, having the physical world live in harmony with the celestial world, maintaining order and balance, is the ideal they called *mꜣꜥt*  .

A "celestial Egypt," in which each administrative district corresponds to a constellation or asterism, would imply a grand vision for the layout of their kingdom. The Egyptians divided the Nile into *nomes*, or districts, called *spt*  , each with a capital city and a patron god. According to Daressy's theory of a celestial Nile, sailing down the river was akin to journeying on the path of the sun through the stars and constellations. In fact, the Milky Way itself was possibly seen as a "water way," perhaps the "Nile in the sky." While Daressy's concept was correct, the methodology presented in this paper is more precise in aligning the constellations with both the Lower and Upper Egyptian nomes (chart 1 and table 1). The present study determines that the nomes of Lower Egypt began on Aquarius and ended on Leo, while the nomes of Upper Egypt began on Gemini, cycled through all the signs, and ended on Capricorn.

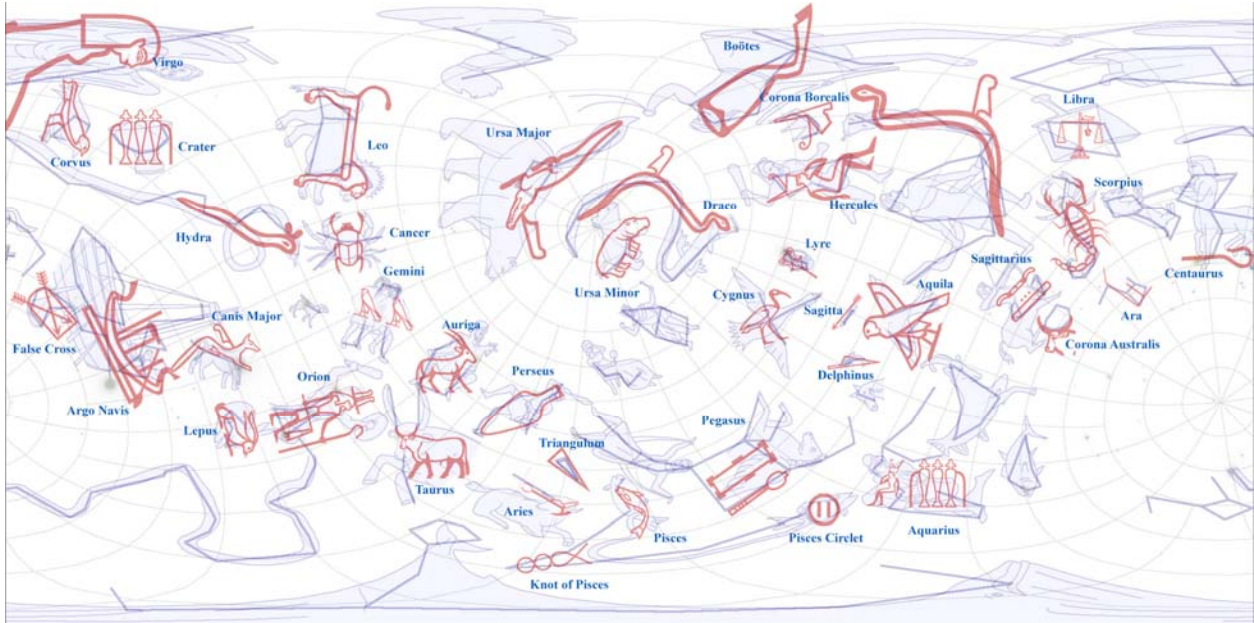

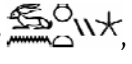



CHART 1. Classical star map with Ptolemaic constellations compared to nome emblems overlaid on a map of the sky circa 3100 BC as seen from Memphis (30.57° N).

Leo, Aquila, and Triangulum

The 20th nome of Upper Egypt, *spd* , named after the falcon war god, who was the son of Sopdet, the goddess of Sirius, provided initial evidence for aligning the emblems with the constellations. The nome's emblem was a plumed mummified falcon resting on a lion-shaped bier. This obscure symbol can be deciphered by observing the same sky as an Egyptian priest, or hour-watcher *wnwty* , would have observed in Memphis, five thousand years ago. The star Sirius, whose heliacal rising heralded the Egyptian new year, would break on the eastern horizon together with the star Algieba, of Leo, represented in the emblem by the lion-shaped bier . At the same time as Algieba and Sirius rose, the star Altair of the eagle constellation, Aquila, would set or "die" on the western horizon as represented by the mummified falcon. Thus, all three stars, Sirius, Algieba, and Altair, would align across the horizon (chart 2).

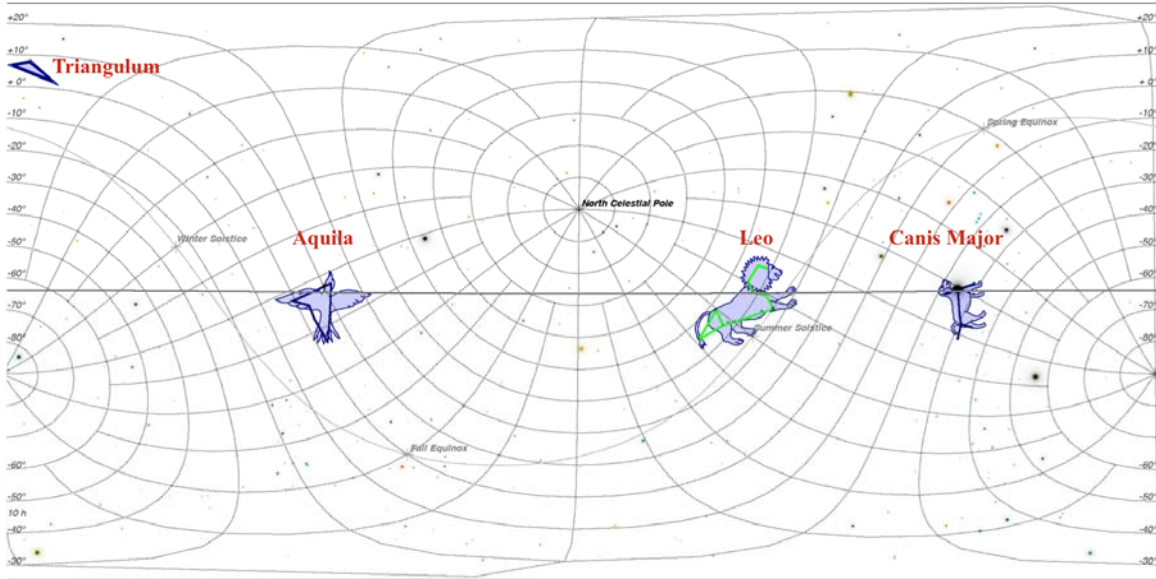



CHART 2. Canis Major and Leo rising, Aquila setting, and Triangulum in upper culmination, representing Sopdu .









One more clue confirms the stellar identification of this nome. While Sirius and Algieba rose, and Altair set, the constellation of Triangulum was in its upper culmination, which may have been represented by the triangle hieroglyph *spd*, meaning “sharp,” both in Sopdu’s name  and in the name for Sirius itself as *spdt* . In fact, Eratosthenes linked this triangular constellation with the Nile Delta. This stellar alignment, fused into the emblem of the 20th nome of Upper Egypt, suggests the existence of Leo, Aquila, and Triangulum in the Egyptian night sky.



FIGURE 1. Daressy zodiac showing the falcon of Horus under the sign of Sagittarius (image edited by author for clarity).

Corroborating the identification of Aquila as an Egyptian constellation, not just Graeco-Babylonian, is the Roman era Daressy Zodiac (fig. 1), which depicts three concentric rings. The outer ring shows the *Sphaera Graeca*, the Hellenistic zodiac that survives to this day (Daressy, 1916). The middle ring depicts the *Sphaera Barbarica* or “foreigner’s zodiac” with the zodiacal signs of the Egyptian *dodekaoros*, which were also recorded by Teucros of Babylon (Boll, Ja’far ibn Muhammad, & Dyroff, 1903). The sign of Sagittarius corresponds to the falcon of Horus, presumably because Aquila rises with Sagittarius.

Virgo

The nome of *nḥn* (Nekhen) , which was represented by a circle with two feathers, is emblematic of the Pisces circlet, which sets opposite Virgo. One of the Egyptian star decans near Virgo was called *bkti* , represented by a pregnant woman, while the name *nḥn*  meant “child”. The town of *nḥb*  (Gr Eileithyiaspolis), at one time the capital of the nome of *nḥn*, was named by the Greeks after the goddess of childbirth, Eilithyia. *Nḥb* was the cult center of *nḥbt* , the vulture goddess and creatrix, emblematic of Upper Egypt. The Egyptians believed the vulture was a mystical self-creating, virginal mother, because the Egyptian vulture shows no external visual differentiation between the male and female of the species. The Egyptian word for “vulture,” *mwt* , also meant “mother.”

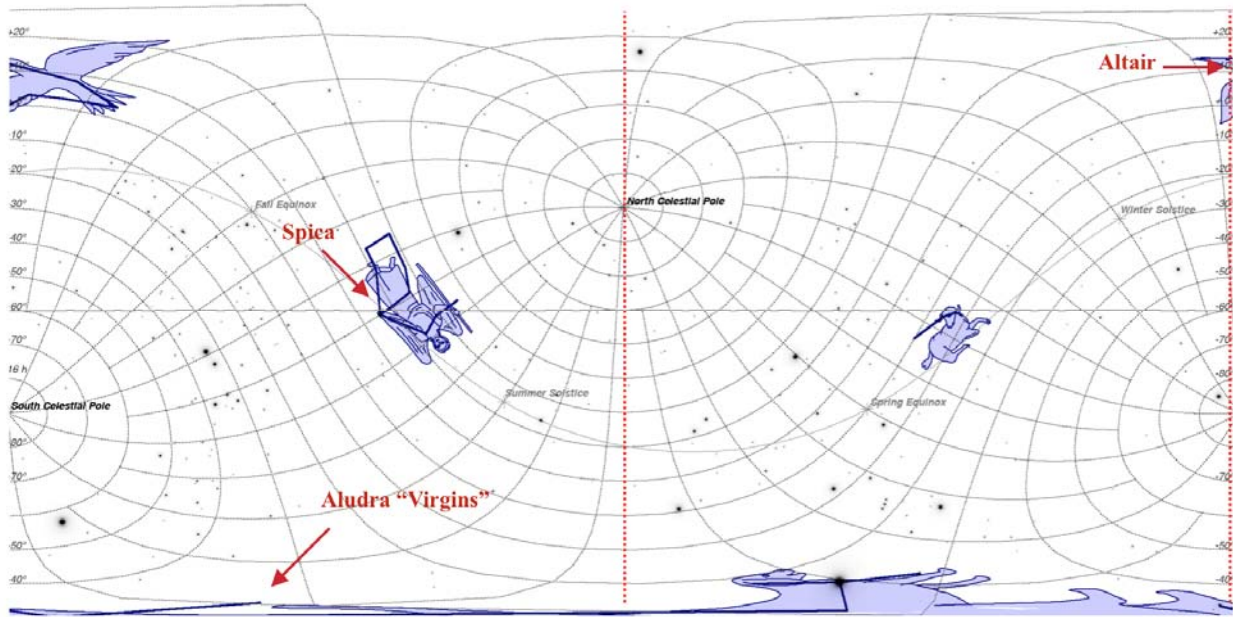





CHART 3. Spica setting with Aludra the "virgins" in lower culmination, and Altair in upper culmination, representing the nome .

Sirius, the brightest star of Canis Major, was identified with the goddess Isis-Sothis, the Egyptian mother goddess. Diodorus explains that the ritual procession of the Festival of Isis was led by dogs, an association illustrated in a passage by Diodorus:

On the stele of Isis it runs: "I am Isis, the queen of every land... I am she who riseth in the star that is in the Constellation of the Dog; by me was the city of Bubastus built."

The capital of the 18th nome of Upper Egypt  was a place for the worship of Anubis, the dog-headed god, as the city was known as the "House of Anubis." This nome corresponded to the time at which Canis Major's star, Aludra, known as the "Virgins" to early Arab astronomers, was in its lower culmination, and Spica, the brightest star in Virgo, the virgin, was setting (chart 3).

Libra and Hercules

The nome of the Oryx  that corresponded to Auriga and the goat Capella, was the site of the mythical battle between Horus and the god Seth as a gazelle. As Daressy discussed, the weight balance, symbol of Libra, was the emblem of the capital of this district (Daressy, 1916). This identification with

in its lower culmination, and in its upper culmination was Canis Major and the star Wezen, which literally means "weight" in Arabic (chart 5).

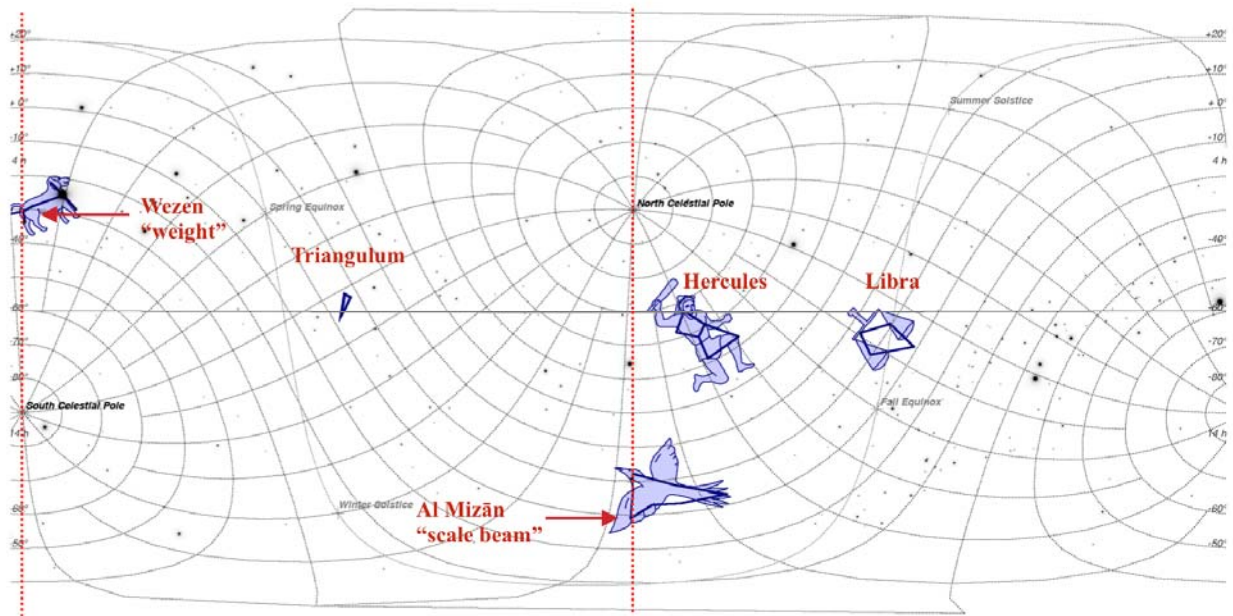






CHART 5. Libra rising, as Triangulum sets, and Canis Major is in upper culmination, as symbolic of the Judgment scene.



This alignment between Libra, Triangulum, Al Mizān, and Wezen provides a possible interpretation for one of the most enigmatic scenes in ancient Egyptian art: the last judgment (fig. 2). One version depicts a kneeling Anubis (Canis Major), adjusting the weight (Wezen) of the scales (Libra). On one side of the scale is the feather of Truth being weighed against the heart of the deceased. The *cynocephale*, or dog-faced baboon of Thoth, sits atop the scales, possibly symbolic of Hercules, which rises with Libra and was known as the Kneeler, *Engonasin*. The Daressy Zodiac (fig. 1) represents the baboon under the sign of Capricorn, perhaps since Hercules sets with Capricorn. Babylonian star lists call the constellation of Hercules, ^{MUL}UR.KU, the "sitting dog."



FIGURE 2. Judgment of the dead scene. Anubis (Canis Major) weighs with the scales of Libra, as interpreted in chart 11.

Orion and Scorpius

The nome of *ꜥndti*  (Andjety) corresponded to the time at which Orion was setting, or “dying” in the western horizon, and Scorpius was rising (chart 6). This remarkable evidence indicates that Andjety represented Orion in the list of emblem constellations. He was a precursor of the god Osiris, *wsir* , who wielded the same crook and flail that would later become Osirian insignias (Hart, 2005). Osiris was known as *sꜣh*   (K Locher, 1991), and was represented as such in the lists of star decans. He was identified as Orion in the Pyramid Texts: “Look! He comes as Orion, Osiris, who has returned as Orion...” (PT 819/20) (Faulkner, 1985). According to Plutarch, the goddess Isis buried her brother, Osiris, in Busiris, the capital of the nome *ꜥndti*, enshrining it as an important pilgrimage center.

The Upper Egyptian nome of Abydos, one of the most important religious centers of ancient Egypt, aligns with the Lower Egyptian nome of Andjety, when Scorpius was rising. According to Plutarch, the great mystery festival that celebrated the death of Osiris occurred in Abydos “when the sun passes through Scorpion” (Plutarch, 1936). The Egyptian association between the scorpion and Scorpius was first proposed by Wells (Wells, 1985). The link between Orion and Scorpius is further demonstrated by one of the titles of Osiris, which was “He who dwells in the house of *srꜥt*  (the scorpion goddess)” (Hart, 2005). This confirms that Scorpius was not only a Graeco-Babylonian but also an Egyptian constellation, known in hieratic as *dꜣr* .

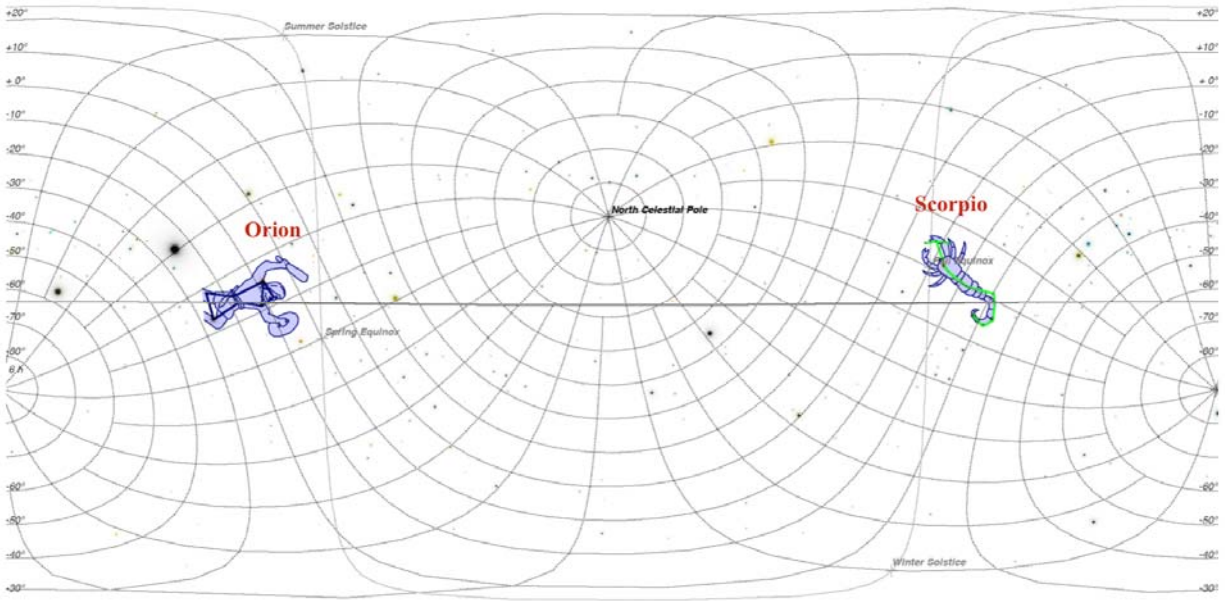





CHART 6. Orion “dying” as Scorpius rises, representing the nome of Andjety .

Centaurus, Sagittarius, Sagitta, and the False Cross

The nome of *t3-sti* , the “land of the bow,” near the border with Nubia, corresponds to the time at which Sagittarius, the archer, was setting, and Orion was rising. It could refer to the stars in Sagittarius, which were known as the bow, القوس, in Arabic. A Babylonian tale recounts how Marduk’s bow was made into a constellation: “The third name, ‘Bow Star,’ he made visible in heaven; he established its position with respect to the gods his brethren.” The MUL.APIN Babylonian star lists preserve the name of a bow constellation as BAN, identified with Canis Major. The Babylonians also had an arrow constellation called ^{MUL}KAK.SI.SÁ, identified with Canis Minor, which sets opposite Sagitta, the arrow. The 4th and 5th nomes of Lower Egypt were represented by crossed arrows over a shield, *nrt* , and correspond exactly to the rising of Sagitta, the arrow, which sets opposite Canis Major. Sagitta also sets opposite the False Cross asterism, which has a star called Aspidiske, Greek for “shield,” the Latin *Scutulum* perhaps emblematic of the shield of *nrt*.

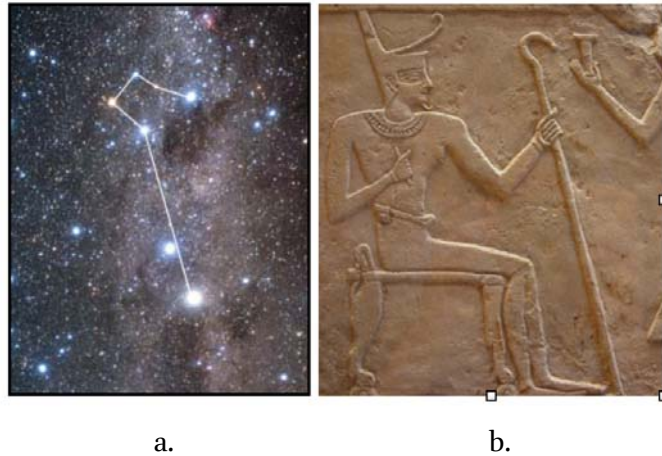


FIGURE 3. (a) Outline of Centaurus as the shepherd's crook. (b) Egyptian shepherd's crook.

In Mesopotamia, Orion was the True Shepherd of Heaven, SIPA.ZI.AN.NA (Rogers, 1998a). The constellation of Centaurus rises in accordance with the 13th nome of Lower Egypt, $\text{ḥ}k\text{z}-\text{ʿ}ndw$ $\text{𓆎} \text{𓆏}$. The constellation matches the shape of the shepherd's crook, $\text{ʿ}ndw$, (fig. 3a) that Andjety and Osiris wielded (fig. 3b) and which represented the name of the 13th nome.

Delphinus

The 22nd nome of Upper Egypt was the knife mdnit . Delphinus, a small but peculiar constellation, sets opposite the star of Denebola in Leo (chart 7). Based on its shape and position on the nome list, there is little doubt that it represented the knife mdnit from the mdnit nome (fig. 4a). Confirming this is a New Kingdom apotropaic wand that depicts an early prototype of the zodiac signs (Serres, 2010) that predates a presumed Ptolemaic-era influence on Egyptian zodiacs. It portrays a knife instead of the lion for Leo (fig. 4b). The Babylonians also had a knife constellation, called $\text{MUL} \text{GÀM}$ $\text{𐎶} \text{𐎵}$, the scimitar or crook, associated with Capella, which rises when Delphinus, the knife, is in its upper culmination.



FIGURE 4. a. Delphinus forming the clear shape of a knife. b. New Kingdom zodiac showing a knife instead of Leo.

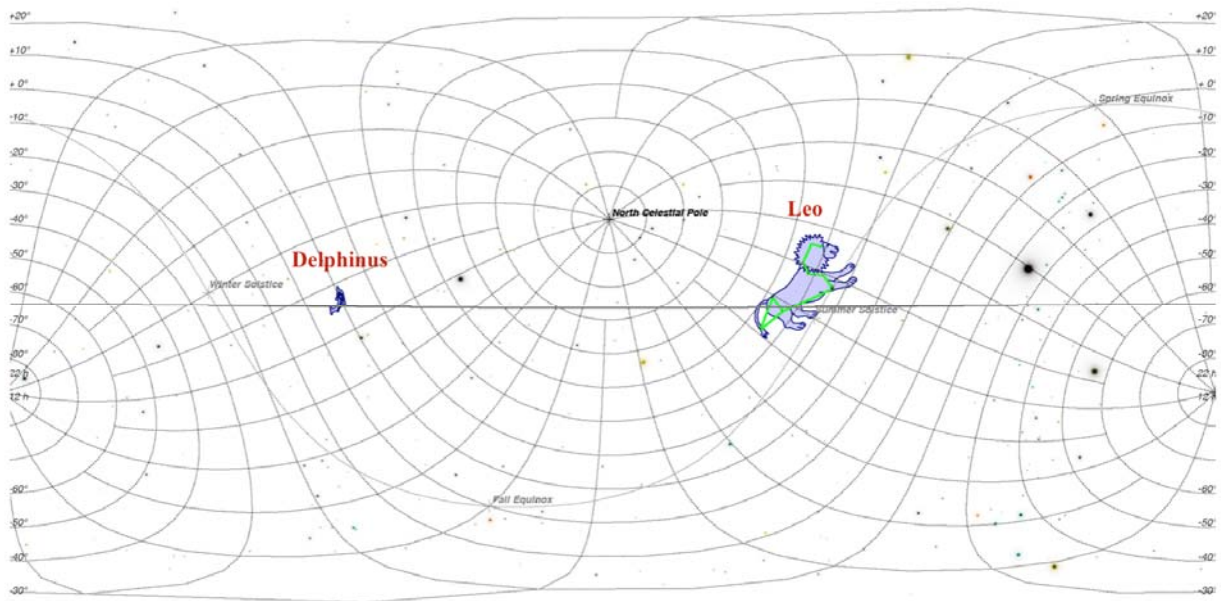






CHART 7. Leo rising as Delphinus sets, representing the nome of the Medenit , the knife.

Capricorn & Aries

A portion of the Greek celestial iconography and zodiac was heavily influenced by the Mesopotamian culture as evidenced by *kudurru* boundary stones and cylinder seals (fig. 5 a, b, c) (Schaeffer, 2006). The "Water-Goat," called ^{MUL}SUHUR.MÁSH    by the Babylonians, was the emblem of the Sumerian water-god Ea and would become the symbol of the zodiacal sign of Capricorn (fig. 5c). However, the fish-goat may also have Egyptian origins, first appearing on coffin lids in the Middle








Kingdom, around 2000 BC. The Egyptians divided the night-sky into 36 decans, the earliest system for organizing the stars, each with a presiding deity (Neugebauer, 1951). Other cultures later adopted similar night divisions, although based on lunar mansions, such as the Hindu *Nakshatras*, the Arabic *Manzil*, and the Chinese *Hsiu* (Weinstock, 1949). The constellation of Piscis Austrinus, the Southern fish, sets with Capricorn. The Egyptian decans listed stars near or that rise with Piscis Austrinus called *hry hpd srt*   , or "Under the tail of the goat," which uses the hieroglyph *hpd* depicting a fish's tail and the hieroglyph *srt* representing a goat (Conman, 2006-2009) (K. Locher, 1981) (Belmonte, 2001). Perhaps, this decan can elucidate the origins of the strange fish-tailed goat image of Capricorn.



FIGURE 5. a. Denderah rectangular zodiac detail of sagittarius holding a bow. b. Babylonian seal depicting winged centaur with scorpion tail. c. Fish-goat emblem of the Sumerian water-god Ea on a boundary stone. (Photos by author)









Aquarius and Crater

On some occasions the emblems match Greek zodiacal imagery in quite surprising ways, as can be seen with *imt-hnt*   of the 18th Nome of Lower Egypt, which means "Southern Prince." The emblem depicts the royal child with water jars *hnt*, and it corresponds exactly to the time at which Aquarius, the water-bearer, was setting. It also aligns with the "Feast of Anket: welcoming the rising of the Nile" on I Akhet 7 (July 25), who is depicted in the Denderah circular zodiac holding two *hnt* water jars (fig. 6a) similar to the depiction of Hapy as Aquarius in the Denderah rectangular zodiac (fig. 6b). That the Egyptians had a vase asterism may be evidenced by a depiction in Ramses VI's tomb (fig. 6c). The Babylonian MUL.APIN lists Aquarius as ^{MUL}GU.LA,  , the "Great One," likely a reference to

the Sumerian water god, Ea, patron deity of the world's oldest city, Eridu, who is often represented sitting on a throne pouring water from a vase (fig. 6d).



FIGURE 6. a. The goddess Anket, holding water jars, below Leo in the Denderah circular zodiac. b. Hapy as Aquarius in the Denderah rectangular zodiac. c. Depiction of a jar constellation from Ramses VI's tomb. d. Sumerian water-god Ea. (Photos by author)

The capital of *imt-ḥnt*, Per-Bast (Gr *Bubastis*) was named after the cat goddess, Bastet, perhaps in reference to the fact that Leo rises when Aquarius sets (chart 8). The 20th nome of Upper Egypt, *nꜣrt-ḥntt*    , Southern Sycamore, also composed of the water jar hieroglyphs, corresponded to the time at which Aquarius was rising (table 1). The 14th nome of Lower Egypt, *ḥnti-izbt*    , represented by the water jar hieroglyph, is emblematic of the rising of Crater, the water-bowl constellation, that sets opposite Aquarius. Plutarch records of the Egyptians that, "in their holy rites, the water jar in honor of the god heads the procession."

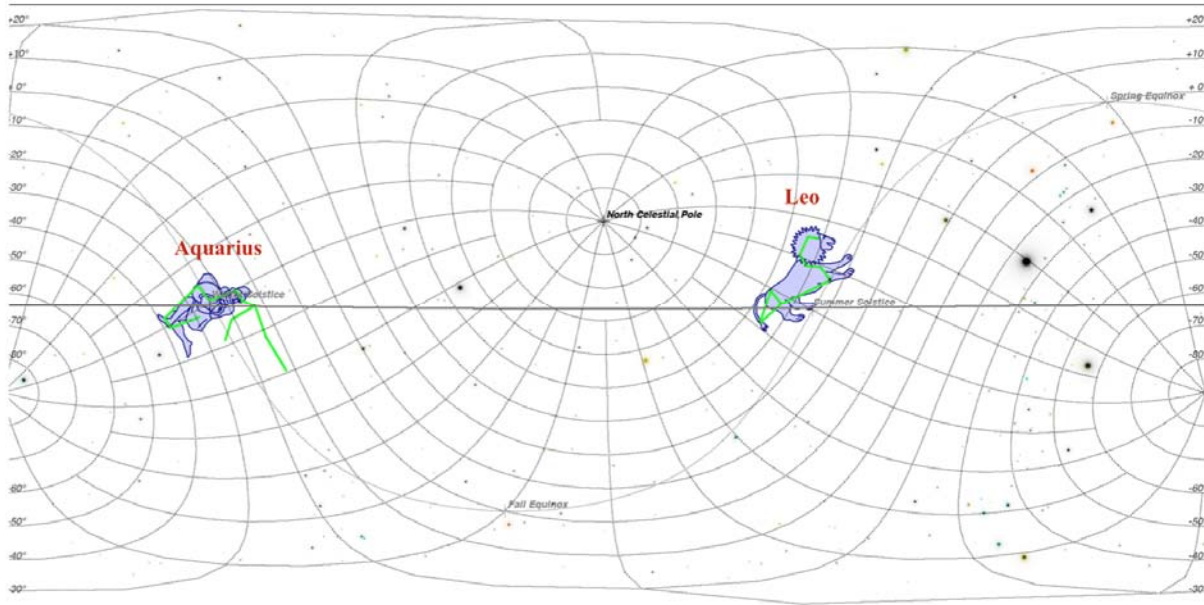







CHART 8. Aquarius setting as Leo rises, representing the nome of *imt-hnt*   and its capital Bubastis.

The Great Square of Pegasus

Rising near Aquarius is the Great Square of Pegasus, which was represented by the “White Wall” nome, *inbw-hd*  (table 1), one of the clearest correspondences between the nomes and the constellations. The Egyptians must have pictured the Great Square of Pegasus as the enclosure wall of a celestial temple. The capital of the “White Wall” was Memphis, near the Great Pyramid of Giza, the largest monument of the ancient world. The Chinese knew some of the stars in Aquarius as *Tien Luy Ching* or the “Heavenly Walled Castle.” They also called one of the stars in Pegasus *Peih*, or “Wall.” The Babylonians knew the square of Pegasus as ^{MUL}AŠ.IKU, or “the field,” and it was one of their most important constellations.

Pisces and the Lyre

On the date of I Akhet 22 (August 9), the Egyptian calendar of lucky and unlucky days advise not to eat fish, since on this date, the gods take on the form of a fish (Maystre, 1941) (Lichtheim, 1976). Reconstructing the night sky for this date during the New Kingdom (1224 BC), we find that the sun sets opposite Pisces and Piscis Austrinus. The 16th nome of Upper Egypt, *h3t-mhit*  was represented by

a fish, and was the cult center of the fish goddess Hatmehit. It corresponds to the time at which Pisces was setting along with the Lyre constellation (chart 9), which has a strong resemblance to a small fish. The Lyre itself, envisioned by the Greeks as the harp of Orpheus, may have been represented by the Sistrum nome , a musical instrument sacred to Isis and the goddess *bꜣt*.

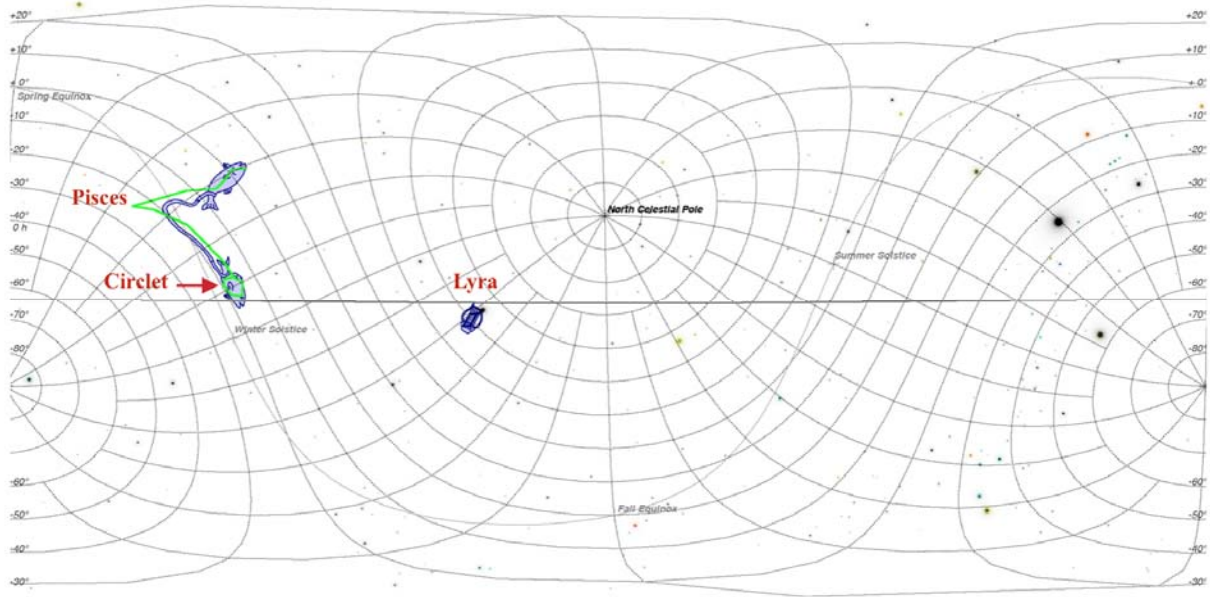








CHART 9. Pisces and the Lyre setting, representing the 16th nome of Upper Egypt 

The capital of the 19th nome, *wꜣbwy* , which corresponded to the rising of Pisces (table 1), was called Oxyrhynchus by the Greeks, so named after the Mormyrus fish that was worshipped by the local city's priests. The Upper Egyptian nome of *nḥn*  (Nekhen) is symbolized by the hieroglyph of a circle with two feathers. It aligns with the rising of the circlet of Pisces (table 1) and matches the circular shape of the constellation. The capital of Nekhen was called Latopolis by the Greeks, named after the Nile perch, *Lates niloticus*, a fish sacred to the goddess Neith, who was venerated at the city. Thus, two very important Egyptian cities, Oxyrhynchus and Latopolis, were both named by the Greeks after sacred Nile fish, and both corresponded to the rising of Pisces. It appears that Ptolemaic Greeks may have been aware of the celestial correspondences of the capitals of Egypt, and named these cities accordingly.

The Knot of Pisces and Corona Borealis

The Denderah zodiac depicts two sacred Nile Carps tied to a cord, representing the Knot of Pisces. The Egyptian month of *mnḥt*  shares an etymology with the word *mnḥt* , which means "clothing," or "fabric." In fact, during this month (II Akhet 5), which would have corresponded to the time at which the sun was in Virgo, rising opposite the knot of Pisces (chart 10), the Egyptians celebrated a festival of offering to Hedj-Hotep, the goddess of weaving. Another goddess of weaving, Tayet, was worshipped at the town of Buto in the 5th nome of Lower Egypt, where her name was also an alternate spelling for the town. This nome corresponds to the time at which the Knot of Pisces was in its lower culmination. One variation of the emblem of the 11th nome of Upper Egypt , which corresponded to the rising of Virgo, represents the twisted flax hieroglyph symbolic of the knot of Pisces. It also represented the Crown of Lower Egypt , which may have been symbolic of the rising of Corona Borealis.

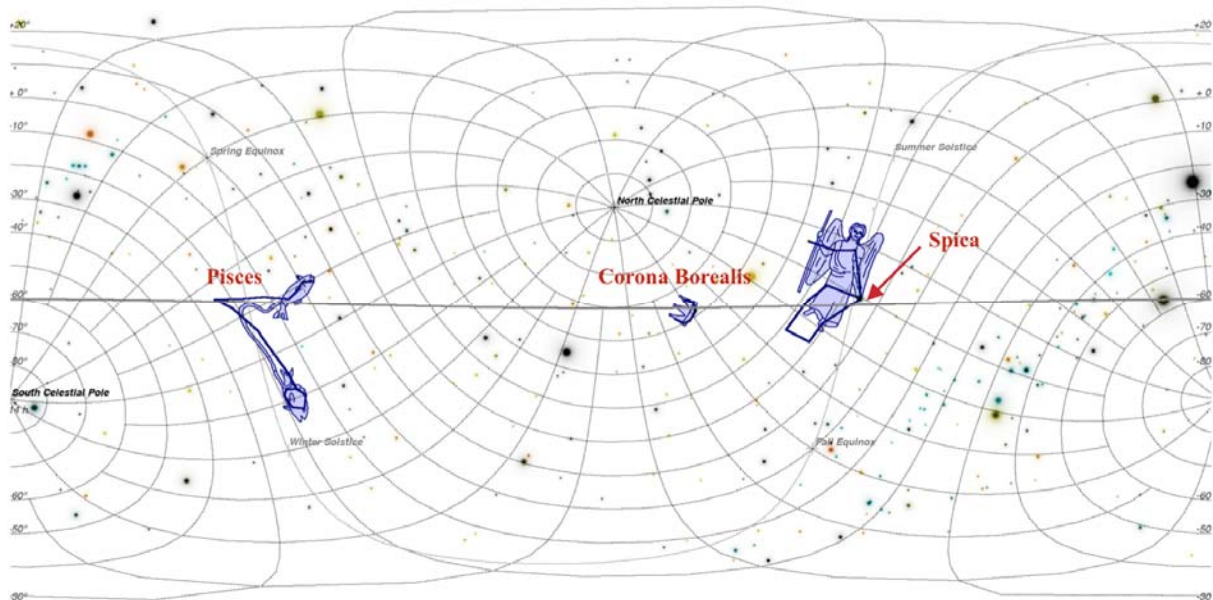

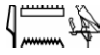


CHART 10. The Knot of Pisces sets opposite Spica and Virgo, as celebrated during the festival for the weaving goddess Hedj-Hotep. Corona Borealis rises with Virgo as the Knot of Pisces sets, as represented by the nome .

Aries

According to Daressy, Thebes corresponded to the sign of Aries, the ram (Daressy, 1916). The priests of Thebes, the capital of Egypt during most of the New Kingdom, worshipped the ram-headed god *imn* . Daressy was partially correct about the link between Thebes and Aries. Based on the sequence of nomes and the corresponding constellations, the powerful capital corresponded to the goat-fish of Capricorn when Aries was in its lower culmination (chart 11).

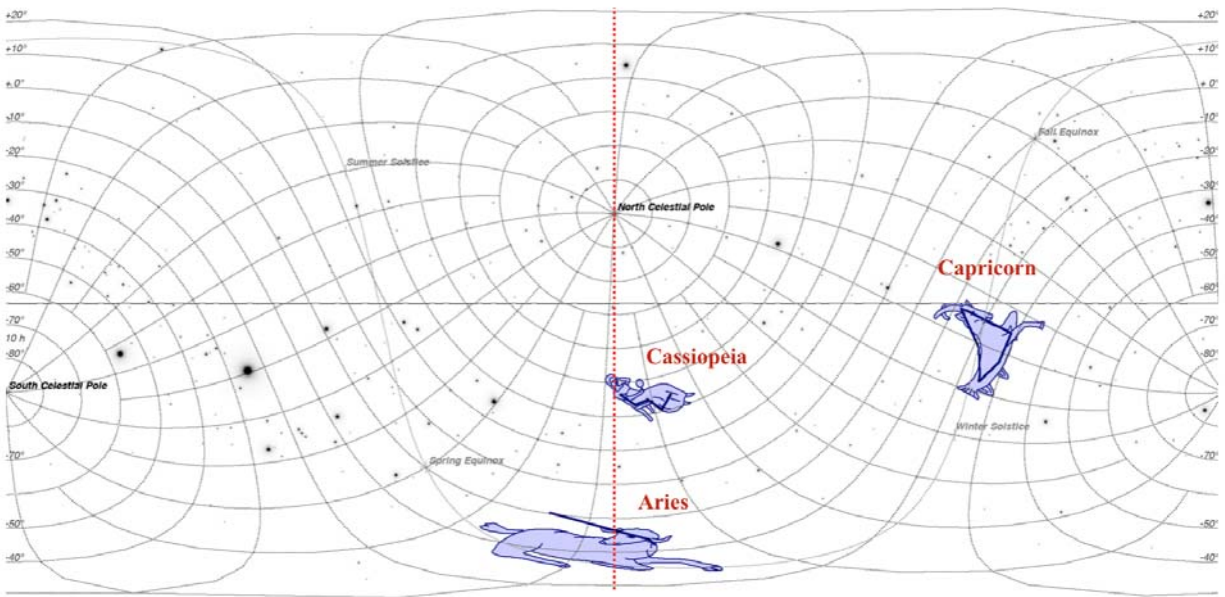





CHART 11. Capricorn rising as Aries and Cassiopeia are in their lower culmination, representing the Theban nome.

Perseus

The 13th nome of Upper Egypt,  , is represented by the hieroglyph of the horned viper of Hydra, the water jars of Aquarius, and the tree (chart 12). The brightest stars in the Perseus constellation resemble the shape of a tree, possibly the sacred Persea tree, *išd*  (fig. 7a), which Ra, in his cat form, protected from the serpent Apophis. Setting with Aquarius was the knife of Delphinus, which symbolizes the knife Ra uses to behead Apophis (fig. 7b). The Babylonian protective lion demon, Ugallu, was often depicted wielding a dagger (fig. 7c).

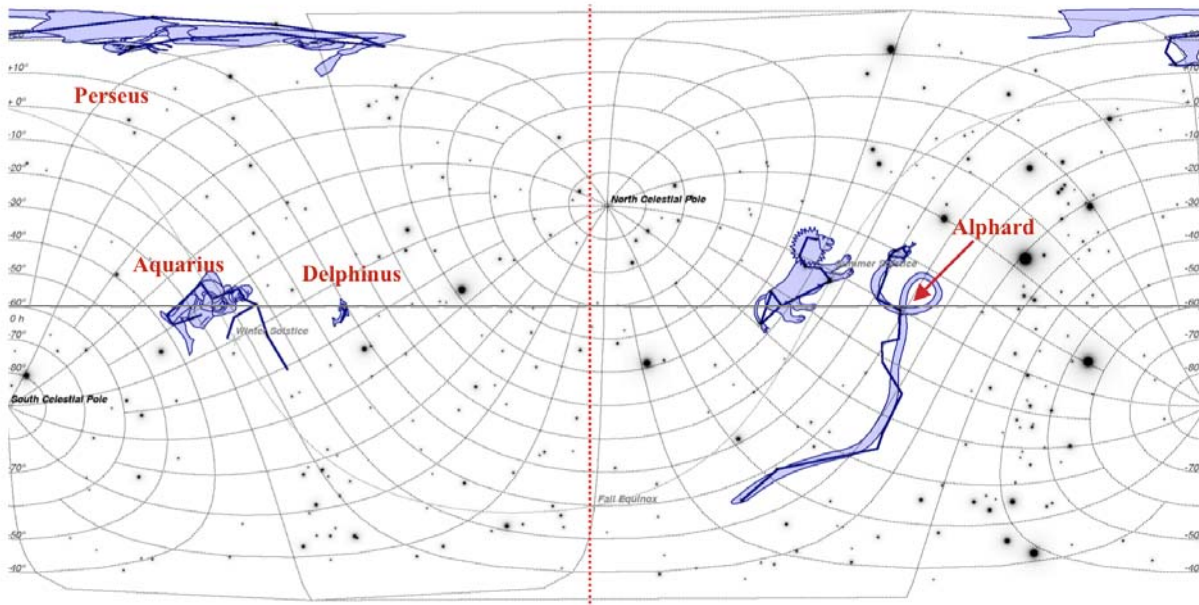




CHART 12. Perseus in its upper culmination while Hydra and the star Alphard rise, and Aquarius sets, representing *ndft-hntt*  



The nome *mnw* , named after the god Min, also means “tree” in ancient Egyptian. This was the district where the city of Panopolis was located and where the Greek hero Perseus was worshipped. According to Plutarch, Osiris’ tomb “lies in the encompassing shade of a persea tree.” The name “persea” is an ancient Greek name for an unidentified Egyptian tree (Quattrocchi, 2000). Goddesses such as Isis and Hathor were called by the epithet “Lady of the Sycamore,” perhaps since Virgo sets opposite Perseus.



FIGURE 7. a. Perseus constellation as the sacred Persea tree, *isd* . b. The rabbit-eared Great Cat of Heliopolis slicing Apophis in front of the sacred tree. c. The long-eared Mesopotamian protective lion, Ugallu, wielding a dagger.

Auriga

The Oryx nome, m^3-hd 𐎠𐎡, aligns with the rising of Auriga's Al Anz, known as the "he-goat" to the Arabs, and Capella, whose name is Latin for "she-goat" (R. H. Allen, 1963). The charioteer of Auriga was often represented holding a small goat, perhaps because he would rise opposite the shepherd, Boötes. The Babylonian Goat-Star ^{MUL}UZA has been identified with Vega, which rises opposite Capella.

Taurus & Corona Australis

Early pastoralists probably domesticated the cow in Southern Egypt as far back as 9,000 years ago (Hirst). They had specially prepared burials for cows, and left rock art depicting cattle dating to 5500 BC (Schild & Wendorf, 2003). During the Egyptian Old Kingdom, the Pyramid texts refer to a "Bull of Heaven" and a "Bull of Light" which is the father of the Pharaoh. ^{MUL}GU₄.AN.NA or the "Bull of Heaven" was the Babylonian name for Taurus. The 10th 𐎠𐎡, 11th 𐎠𐎡, and 12th 𐎠𐎡 nomes, all depicted the bull in their emblems. They fall within the time at which Scorpio was rising and Taurus was setting. Corroborating this is the fact that the Daressy zodiac represents the bull for the sign of Scorpio (fig. 1), which confirms that the Egyptians also saw Taurus as a bull.

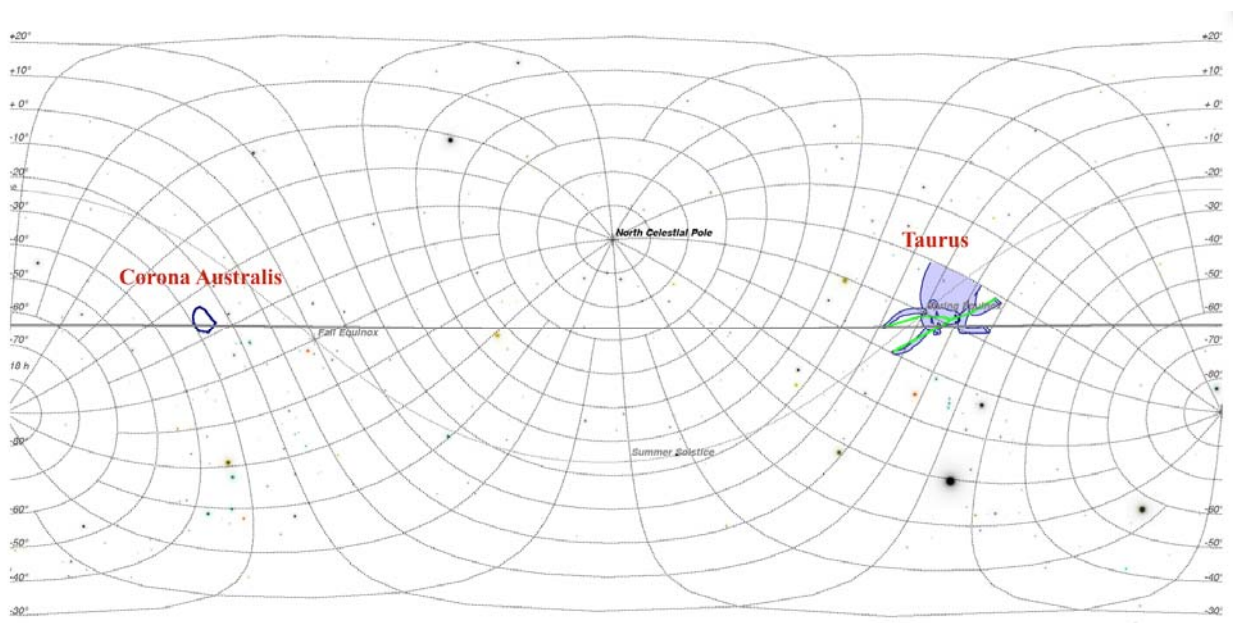


CHART 13. Taurus rising as Corona Australis sets, representing, the
 "Mountain Bull" 𐎠𐎡.

The "Mountain Bull" 𐌨𐌨 nome corresponds to the rising of Corona Australis, which sets opposite the Hyades of Taurus (chart 13). Given the horn-like appearance of Corona Australis, the Egyptian may have seen the constellations as the horns of the bull (fig. 8). Corona Australis may have been represented in Seti I's tomb (Eisler, 1941), indicating that the Egyptians recognized it as an asterism. The Babylonian MUL.APIN star tablets make reference to the "Crown of Anu" in conjunction with the Taurus constellation, the heavenly steer.

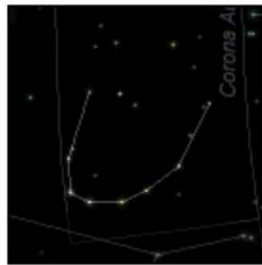



FIGURE 8. Outline of Corona Australis, possibly the horns of Taurus.

Canis Major

The identification of Sirius and Canis Major with dogs is found in disparate cultures all over the world. To the Phoenicians, Sirius was *Hannabeah*, "the Barker." In China, Sirius was known as *Lang Hsing*, or "Wolf Star," and *Tseen Lang*, "Heavenly Wolf." The Chinese asterism of the Celestial Wolf 天狼 was part of Canis Major, while in the opposing Sagittarius the Chinese had the Dog 狗 and Dog Territory 狗國 asterisms. The Alaskan Inuits envisioned Canis Major as a "Moon Dog." To them Sirius was known as the "Red and White Fox," both trying to go down the same hole. The Seri of the Southwest, the Osage, and the Cherokee Indians also saw the Canis Major constellation as a dog (Kelley & Milone, 2005).

Diodorus records how, in imitation of funerary rituals performed by the Egyptian priests of Anubis, the ancient Greeks also wore dog masks, representing the hound of Hades, Cerberus, during sacred funeral rites (Siculus, 1933-1967). The dog as psychopomp or guardian of the underworld became a widespread symbol throughout the world: from Anubis, to the Greek Cerberus, the Germanic hell-hound Garmr, the Vedic sons of Sarama, Odin's two wolves, and Arawn and his hounds (Menache, 1997).

The jackal nome of *inpwt* , where Anubis was worshipped, corresponded to the time at which Canis Major and Sirius were in their lower culmination or "the underworld," and the star Edasich of Draco, known as the "hyena," الذئح by early Arab astronomers (aṣ-Ṣūfī, 1874), was in its upper culmination. Meanwhile, Lupus, known as UR.IDIM, the "mad dog," by the Babylonians, was setting along with the star Auva, العواء, the Arabic "the barker" (chart 14). This could indicate that like the Greeks and Phoenicians, the Egyptians also saw Canis Major as a dog. The New Kingdom apotropaic wand depicts a dog for the sign of Capricorn (fig. 2), perhaps because during that time, Capricorn set while Canis Major rose.

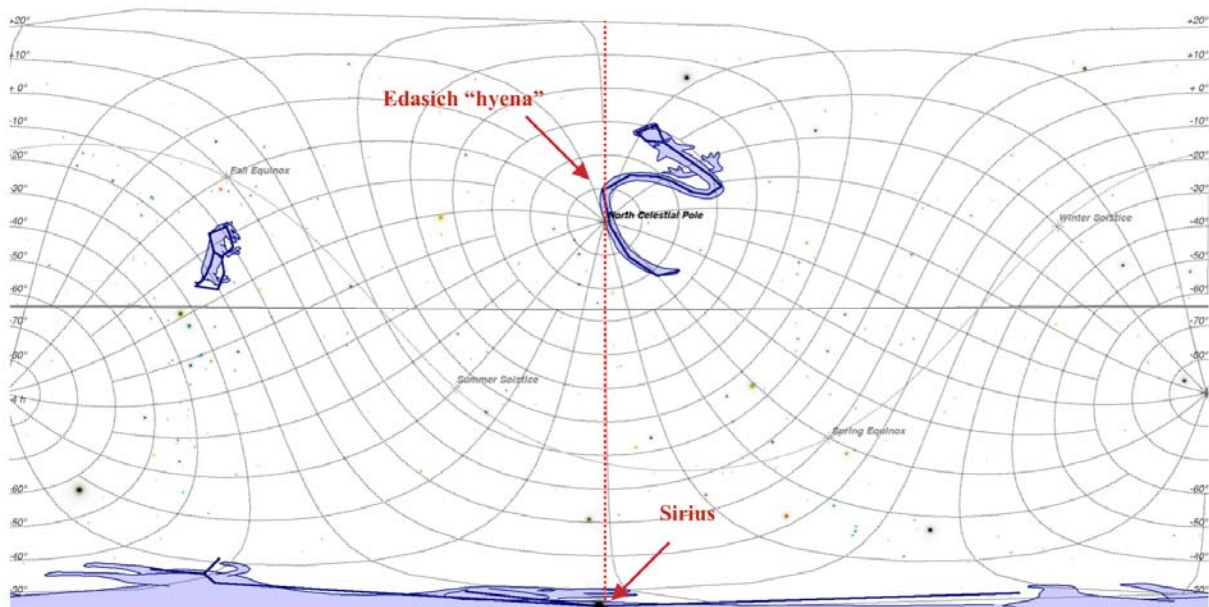









CHART 14. Edasich Draconis, "the hyena," in its upper culmination, while Sirius is in its lower culmination and Lupus sets. Representing the jackal nome of *inpwt* . The star Auva "the barker" is setting.

Several festivals during the ancient Egyptian calendar confirm the association between the dog-headed funeral deity, Anubis, and the constellation of Canis Major, or "great dog." The Cairo Calendar documents for the day of II Akhet 4 (August 21) show it as the "day of the going forth of Anubis for the inspection of this *w'bt* for the protection of the body of the god" (Bakir, 1966). This date corresponds precisely to the time at which Canis Major was in its lower culmination during sunset. On IV Peret 2 (February 15), "The Majesty of Geb proceeds to the throne of Busiris to see Anubis, who commands the council on the requirements (of the day)" (Bakir, 1966). This event corresponds to the

time at which Canis Major was in its lower culmination at sunrise (chart 14). The festival of IV Shemu 22 (July 5), "Feast of Anubis who is on his mountain" (Bakir, 1966), marks the nearly heliacal rising of Sirius and Canis Major. The "Going Forth of Anubis" on III Peret 6 (January 20) during the time of Aquarius, corresponds to the time at which Canis Major rose as the water-bearer set.









The Egyptian word for "jackal," *sb* , is nearly identical to the Egyptian word for "star," *sb*  , perhaps because Sirius, the dog-star, is the brightest star in the night sky. The Pyramid Texts of Unas refer to a "Jackal" star, "your nose as the Jackal — an Imperishable (circumpolar) Star," which could be Edasich, the "hyena," or Thuban, a Draconis, which was known as Al-dhi'b الذئب, to Arab astronomers, meaning "the wolf." Thuban or Edasich could have been represented in the Denderah circular zodiac by the circumpolar wolf figure on a hoe. In Babylon, there was also a circumpolar "fox" star called ^{MUL}KA₅.A   .

On the Denderah zodiac, between other circumpolar constellations, the figure of the jackal appears to be on top of a hoe (fig. 9). Whenever the herald of the New Year, Sirius, rose in the sky, Triangulum was in its upper culmination. In fact, the Babylonian name for a Trianguli was ^{MUL}UR.BAR.RA, the "Wolf, seeder of the plough" (Hunger & Pingree, 1989) since Triangulum was seen as a plough by the Babylonians. The Jackal is also touching the beak of an upside down falcon, probably representing the setting of Aquila as Sirius rises.



FIGURE 9. Jackal on a hoe, representing Sirius rising as Triangulum, is in its upper culmination from the Denderah zodiac.

Gemini

Gemini was known as ^{MUL}MASH.TAB.BA.GAL.GAL      , "the twins," to the Babylonians. The double falcons *ntrw*   of the 5th nome of Upper Egypt, which were also known as the "Two

Gods," represented the constellation of Gemini, the twins. This nome represented the time at which the eagle, Aquila, rose in the East, and the stars Castor and Pollux of Gemini set in the West, providing one of the clearest pieces of evidence that the nomes corresponded to specific constellations (chart 15).

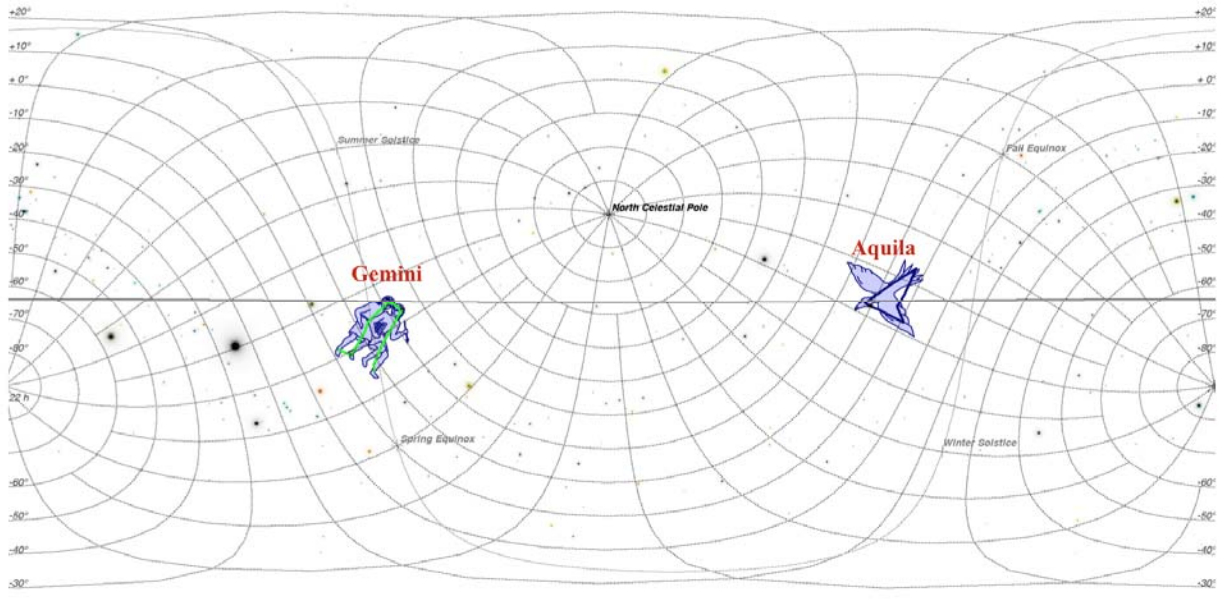







CHART 15. Aquila rising as Gemini sets, representing the nome of the double falcons  .

Lepus

Even the relatively minor Greek constellation Lepus, the rabbit that Orion hunts, has a parallel in the Egyptian nome *wnt* . The patron god of Unet was the ibis-headed lunar deity Thoth. There is no mention of a "rabbit constellation" in a dynastic text or monument, however the constellation may have been represented by Unet, the rabbit goddess herself.

Cancer

While not represented in the Nomes, Ptolemaic-era zodiacs depict the sign of cancer, the crab, the Babylonian ^{MUL}AL.LUL, as the scarab beetle, an insect which the Egyptians saw as metaphoric of their sun god, Ra, as it rolled its dung ball across the ground like a celestial sphere. The insect, a perennial inhabitant of the desert tombs of Egypt, represented the solar god *hpri* . His major cult center was in

Heliopolis, capital of the 13th Lower Egyptian nome *ḥkꜣ-ḥndw* , which corresponded to the time at which Libra was rising, and Cancer was in its upper culmination (chart 16).

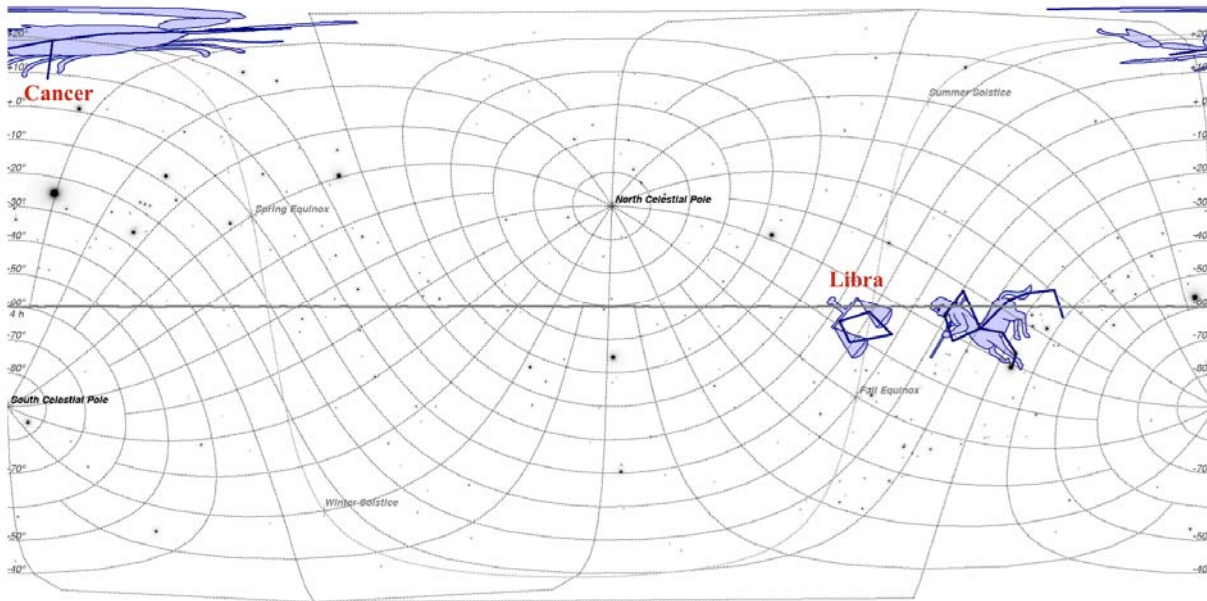




CHART 16. Libra rising with Cancer in its upper culmination, representing the cult center of *ḥpri*  in Heliopolis.

II. The Circumpolar Stars

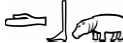

Ursa Minor


Clagett wrote that the identification of the Northern constellations present in the ancient Egyptian celestial diagrams was “extremely difficult if not impossible” (Clagett, 1995). Ancient Egyptian astronomical ceilings that depicted the circumpolar constellations often pictured a female hippopotamus figure with a crocodile tail, occasionally named *ꜣst-dꜣmt*, Isis-Djamet. She is probably a representation of the nursing goddess, Taweret  that also has a crocodile tail, and stands on her two feet (Lull & Belmonte, 2006). Locher tried to associate Taweret with the stars of Draco (K Locher, 2001), drawing the figure of the deity by combining various constellations, including Draco. However, the evidence indicates that the hippopotamus was associated with Ursa Major or Ursa Minor. Early Greeks or Minoans, through a diffusion of the cult of Taweret, may have interpreted the bipedal

hippopotamus figure of Taweret as a regional bear, an animal that, unlike the African hippopotamus, actually stands on its hind legs (fig. 10). It has been argued that Ursa Major as a bear may have Ice Age origins (Julien, 2012) to account for the wide dispersal of the myth.




FIGURE 10. a. Ursa Major as the bear, Akkadian *dabû*. b. The goddess Taweret. c. The hippopotamus, Egyptian *dib*, as Ursa Minor.

In Greek tradition, the earliest mention of the bear constellation comes from Homer, circa eighth century BC. The Egyptian word for “hippopotamus,” *dib* , is the probable origin for the Akkadian *dabû* (Cohen, 1947) (Civil, 1998), Hebrew *dōbh*, Arabic *dubb*, and Ethiopian *dēb(b)* meaning “bear” (Botterweck & Ringgren, 1979) from which the Arabs named the brightest star of Ursa Major, *Dubhe* or “she bear.” These terms for “bear” could also be related to the Egyptian word for crocodile, *dpy*  (by interchanging the plosives “p” and “b”).


Lull and Belmonte claimed that Taweret (in her form as Ipet) was the same as the hippopotamus figure present in Ramesside star charts, called *rrt*, which means “sow” in ancient Egyptian. The Egyptians incorrectly classified the taxonomy of the hippopotamus as being part of the pig family. While the bear constellation does not appear to have Mesopotamian origins since Ursa Major (and perhaps Ursa Minor) was originally known to them as the wagon, ^{MUL}MAR.GÍD.DA (G. A. Davis, 1946), the Babylonians had a circumpolar star or constellation, which has not been definitively identified, called ^{MUL}ŠAH, “the pig,” perhaps etymologically related to the Egyptian šꜣ , “pig” (PIE *sū* meaning “sow”).

Ursa Major was a she-bear to the Greeks, the nymph Callisto (Καλλιστώ), who resembles Taweret, a female hippopotamus with nursing attributes. Taweret was seen as a protectress of childbirth and pregnancies, due to the female hippopotamus’s behavior defending her young. Her

epithets included "Lady of Heaven" and "Mistress of the Horizon." Taweret did not have any major cult centers, since she was worshipped as a household goddess, but another hippopotamus goddess, *ipy* (Ipet), with iconography similar to Taweret, was worshipped at Thebes. Given the Egyptian taxonomical classification of hippopotamuses as pigs, it is conceivable that Ipet's name may be related to another Egyptian word for pig, *iph* . Ipet was worshipped at a temple in Karnak (*ipt-sw*), dedicated to the "Great Ipet." The Theban nome corresponded to the time at which Capricorn was rising, and Polaris, of Ursa Minor, was in its lower culmination. In its upper culmination was Virgo, perhaps explaining the nursing, motherly qualities of the deity. More than Ursa Major, the hippopotamus matches the shape of the constellation of Ursa Minor, with its distinctive curvature following the "pregnant" belly of the mythological figure (fig. 10c).

Around 1800 BC, the cult of Taweret spread to the Levant region and then to Minoan Greece (Weingarten, 1991). The association between the female bear and Ursa Major probably also spread to the distant corners of the world (Gibbon, 1964) (Berezkin, 2005). Given the predynastic origins of Taweret, her astronomical associations, the philological origins for the word "bear," and the diffusion of the cult of Taweret, it is reasonable to assume that the bear constellation originated in ancient Egypt, as the female hippopotamus.

Ursa Major

In astronomical ceilings, the crocodile is often called *ḥkw n s'k*, "The Plunderer," and has been linked with a variety of constellations by Egyptologists. While Ursa Minor may have been the hippopotamus in ancient Egypt, Ursa Major may have been pictured as the crocodile, also a circumpolar constellation, that often accompanies Taweret. The long tail of Ursa Major resembles a crocodile more than a bear or a hippopotamus (fig. 11). Taweret also had crocodilian attributes, which may have added to the confusion between Ursa Major and Ursa Minor. The Sumerian *dimšah*, meaning "hippopotamus," may exist as the Arabic *timsah*, meaning "crocodile," with an Egyptian origin in their word for crocodile, *msh*  (Civil, 1998), compounding the scribal confusion between the two circumpolar aquatic creatures. Unconvincingly, to justify the long tail of Ursa Major and Ursa Minor, which is uncharacteristic of bears, the Greeks claimed that when Zeus threw Callisto and her son, Arcas, to the heavens, their tails stretched.

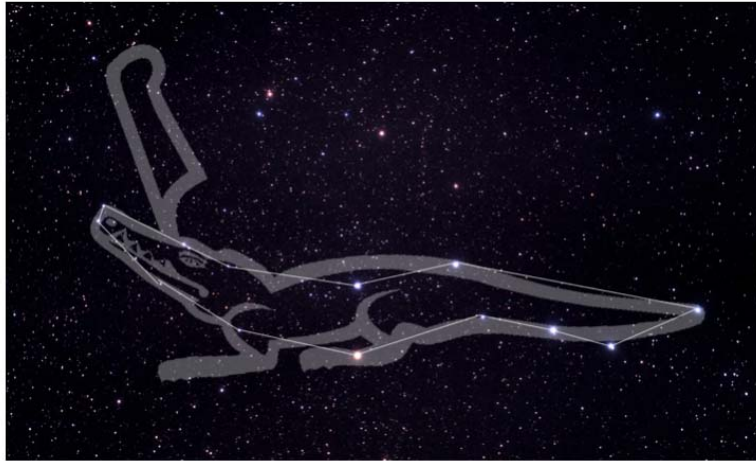




FIGURE 11. Ursa Major as the crocodile.

The sixth nome of Upper Egypt, *ikr* , whose emblem was a crocodile, corresponds to the time at which the star Alkaid of Ursa Major, the last star on the tail of the crocodile, was in its upper culmination. The "Birth of Sobek," the crocodile god *sbk* , on II Peret 11 (December 28) corresponded to the time at which the sun was in Capricorn, and as it set, Alkaid was in its lower culmination. The star Muscida, Latin for "muzzle," could represent the crocodile's snout and in fact, the heliacal rising of the star Muscida may have been celebrated during the festival of the "Day of the cutting out of the tongue of Sobek (the crocodile god)" on the I Shemu 14 (March 29) (chart 17). The same festival happened on II Akhet 22 (September 8), and it marked the rising of Muscida, "the tongue of Sobek," with Pisces during sunset. In fact, the Daressy zodiac represents the crocodile within the sign of Pisces. The shape of the constellation, the position of the crocodile nome, Ptolemaic era portrayals, and festivals celebrating Sobek, all indicate that Ursa Major was seen as the crocodile in ancient Egypt.

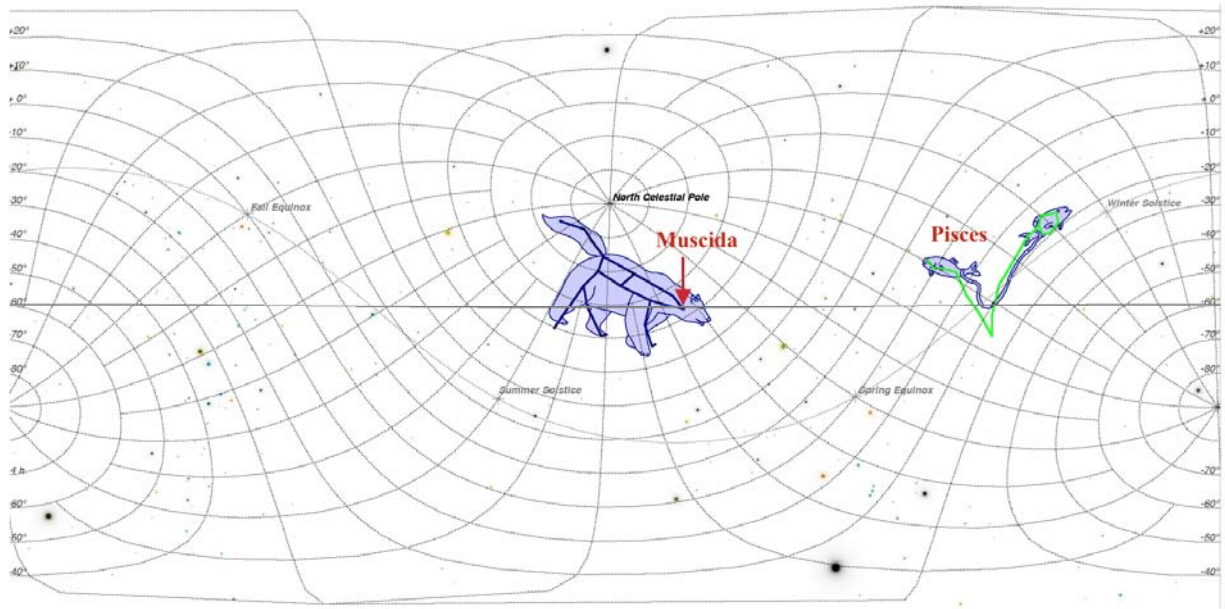





CHART 17. Ursa Major and Muscida "the muzzle" rise with Pisces, representing the day of "Cutting out the tongue of Sobek."

Boötes

In the past, Ursa Major was identified with the foreleg constellation Meskhetyu   (Renouf, 1874) (Pogo, 1930) (Clagett, 1995), supported by an interpretation of the Great Magical Papyrus of Paris that states that the "bear" was a foreleg (Neugebauer & Parker, 1960). Despite this, there is another possibility. The foreleg could be the constellation of Boötes since it corresponds to the second nome of Lower Egypt, *hps* , when the star Arcturus was in its upper culmination and Capricorn was rising. Confirming that this nome represented Capricorn, was a festival during the sign of the goat-fish, on the II Peret 13 (December 28), called "Day of Sekhmet going forth to Letopolis (the capital of the *hps* nome)." Sekhmet was a lion-headed goddess whose festival may have represented Leo rising opposite Capricorn.

A Late Period festival, during III Shemu, when the sun was in Gemini, was marked by throwing a bull's leg into the sky (Alliot, 1949-1954) as part of the marriage of Hathor and Horus at Edfu (second nome of Upper Egypt). At sunrise, when the sun was in Gemini, Boötes would be setting. During sunset, Arcturus and Boötes would be in their upper culmination as seen in chart 16. The fact that Boötes (in particular the star Seginus) sets, while Orion rises, explains the association between

Osiris and Meskhetyu present in the Kom Abu Yasin bull coffin. This association has puzzled researchers who believe that Meskhetyu corresponds to Ursa Major (Lull, 2006). The first cataract of the Nile at Elephantine, in the first nome of Upper Egypt, corresponded to Gemini, and in the late period it was believed that the Nile surged forth from the lower leg of Osiris, the holy relic preserved there (Kees, 1961).

This new interpretation of Meskhetyu is evidenced by observation with the naked eye on a clear night. The stars form the undeniable and perfect shape of an animal foreleg, including the kinks of the leg, with the hoof composed of Muphrid, υ Bootis and τ Bootis (fig. 12). Ancient Egyptian depictions of Meskhetyu match the constellation, even more precisely than the Chariot of Ursa Major. Meskhetyu was originally pictured as an adze that supposedly resembles Ursa Major, however, the ancient Egyptian adze, with its peculiar shape, is also a better match with Boötes. The adze was used in the Opening of the Mouth ceremony, where it magically allowed the mummy to speak and breathe.

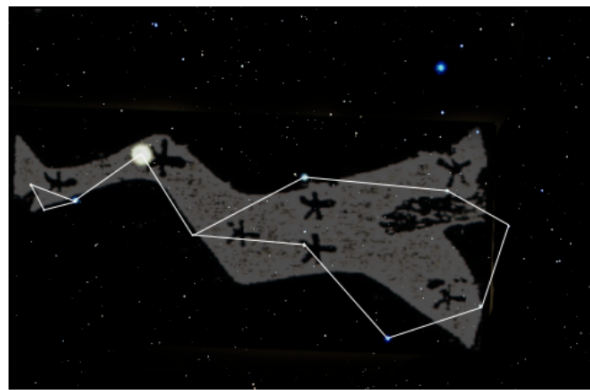



FIGURE 12. Boötes redrawn with Meskhetyu overlaid.

Meskhetyu was also associated with the foreleg of the god Seth. The Papyrus Jumilhac of the Ptolemaic period states that the foreleg of Seth is thrown into the heavens where it is guarded by the great hippopotamus goddess (Vandier, 1962). The 11th nome of Upper Egypt, š^3 , was represented by the animal of Seth (perhaps a donkey). It corresponded to the time at which the three horse-related constellations were aligned. Muphrid rose in the East, while Scheat and Pegasus, the flying horse, were setting, and Sagittarius, the centaur, was in its lower culmination (chart 18). Scheat was known to early Arab astronomers as the "horse's shoulder." The Daressy zodiac represented Leo as the Donkey, perhaps since Pegasus set while Leo rose. Leo also rose opposite the small constellation

Equuleus, "the horse", which incidentally rises opposite Cancer and the stars Asellus Australis and Asellus Borealis, the donkeys Dionysus and Hephaestus rode against the Titans.

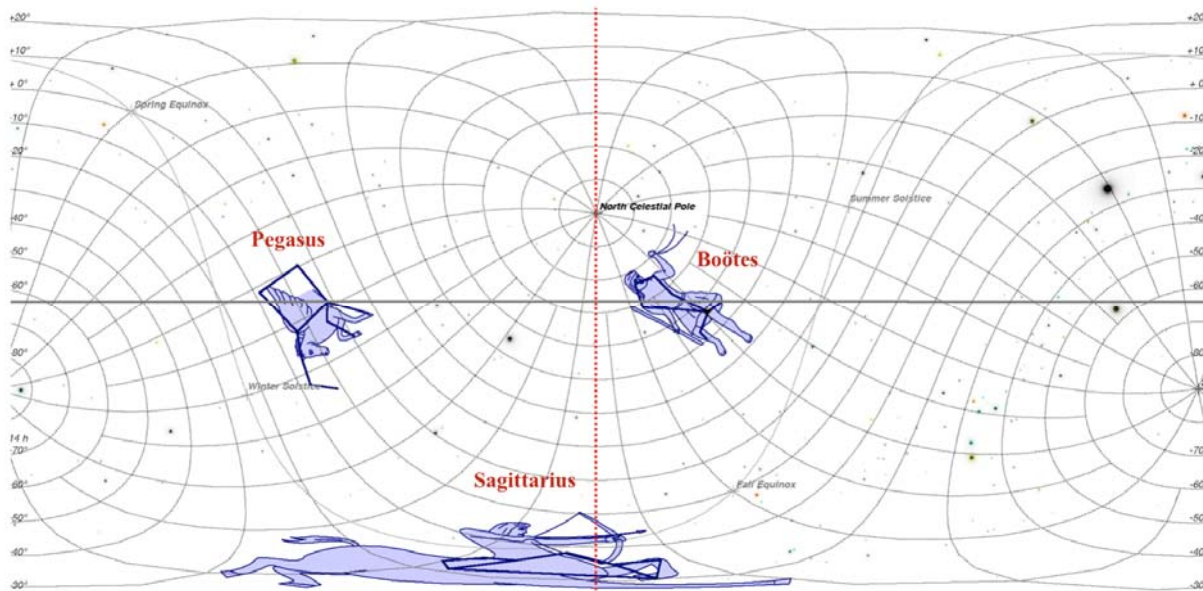



CHART 18. Boötes "the foreleg" rising, Pegasus, the winged horse, setting, Sagittarius, the centaur, in its lower culmination, representing the 11th nome of Upper Egypt, .

A Great Alignment

The foreleg of the Egyptian god Seth was tethered to a mooring post by the hippopotamus goddess Taweret, which is reminiscent of the Babylonian epic of creation, in which Marduk fashioned earth and heaven by dividing the body of Tiamat. He used her thigh to prop up the two realms, and, to keep them together, he bound them with a rope made from her tail. In the epic of Gilgamesh, one of the heroes tears off one of the legs of the heavenly bull of Taurus, and throws it to Ishtar who wails over it. On some occasions, Meskhetyu is represented as a bull's head, attached to the foreleg. Arcturus sets opposite Taurus, which further confirms Boötes as the foreleg. In fact, Boötes, the Babylonian, ^{mul}ŠU.PA, was identified with the god Enlil, who was sometimes depicted with the hind legs and horns of the bull god.

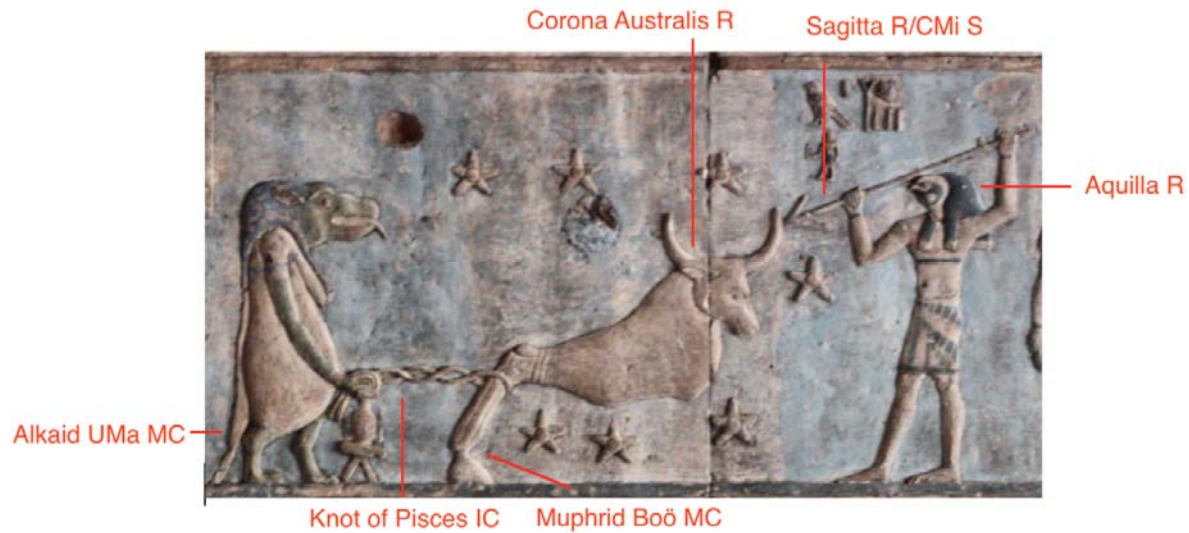


FIGURE 13. Denderah rectangular zodiac detail with astronomical identifications. (Photo by author)

A detail of the frieze in the great Hipostyle Hall of Denderah depicts a falcon god spearing Meskhetyu, who is tied to a rope by Taweret (fig. 13). An astronomical interpretation of this depiction supports the claim that Boötes was Meskhetyu, Ursa Minor was the hippopotamus, and Ursa Major was the crocodile. A re-creation of the night sky from the period at which the temple was first built, during the Middle Kingdom (Kipfer, 2000), reveals a magnificent alignment between the circumpolar stars. Both Alkaid of Ursa Major (the crocodile) and Muphrid of Boötes (the hoof of the foreleg) were aligned on the meridian. In its lower culmination was Polaris, the tail of the hippopotamus of Ursa Minor. Meanwhile, rising on the East was Sagitta, the arrow, with Aquila, the eagle. In the rectangular zodiac, this scene was placed next to Sagittarius, exactly when Aquila and Sagitta were rising (chart 19).

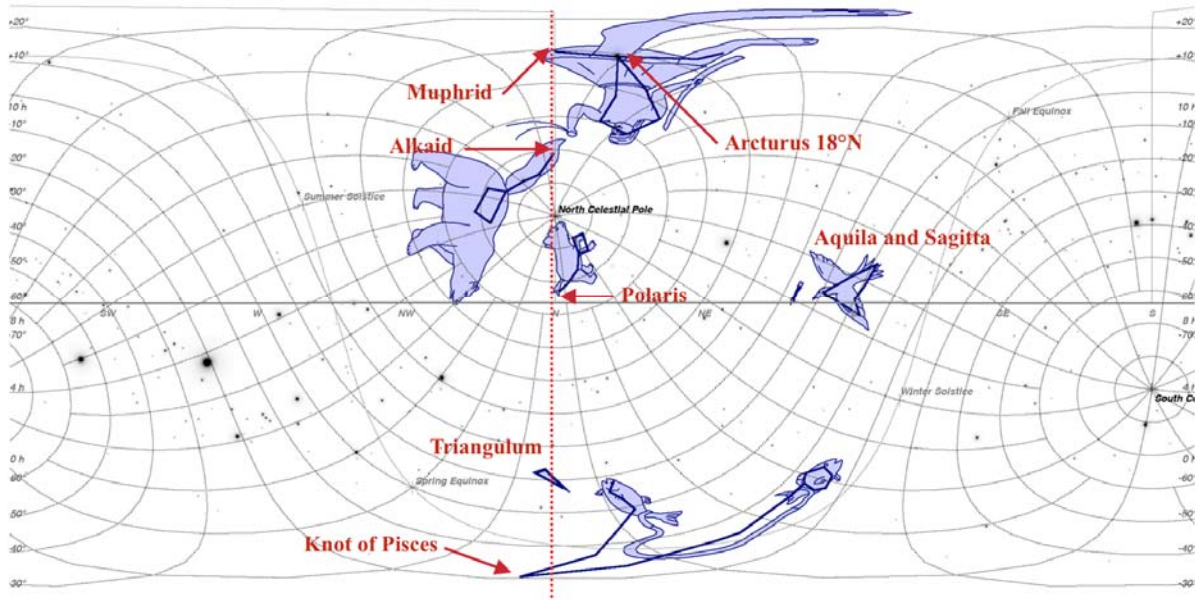



CHART 19. Aquila, Sagitta are rising, Polaris and Pisces are in their lower culmination, and Alkaid and Muphris are in their upper culmination, as depicted in the rectangular zodiac of Denderah (fig. 13). Arcturus is at 18°N, the orientation of the Denderah temple.

While Alkaid, Muphris, and Polaris were aligned on the meridian, the Knot of Pisces, the Arabic *Alrischa* “the cord,” was in its lower culmination, which could symbolize the cord (or “golden chain”) tied to the foreleg on the Denderah zodiac (fig. 13). As discussed by Spence (Spence, 2000), two circumpolar stars such as Polaris and Alkaid could have been used to pinpoint the North Celestial Pole by sighting a line between them. Around 2100 BC, at the beginning of the powerful Eleventh Dynasty, Polaris, Alkaid, and ϵ Bootis (the tip of the hoof) were in perfect alignment on the meridian.

Draco

Identifying Böotes as the foreleg constellation permits a reinterpretation of the circumpolar constellation Draco, the serpent. Taweret, which the present analysis has already identified as Ursa Minor (or perhaps Ursa Major), was often pictured alongside her serpent consort Apophis. The tenth nome of Upper Egypt, *w3dyt* , the rearing cobra, corresponded to the constellation Draco, when the star Eltanin of the head of the serpent dipped below the horizon and was in its lower culmination, while the star Unukalhai, from the constellation Serpens, rose in the east. Meanwhile, the head of

Hydra, the water serpent, was in its upper culmination (chart 20). This nome represented the perfect alignment between the three serpent constellations of the celestial sphere.

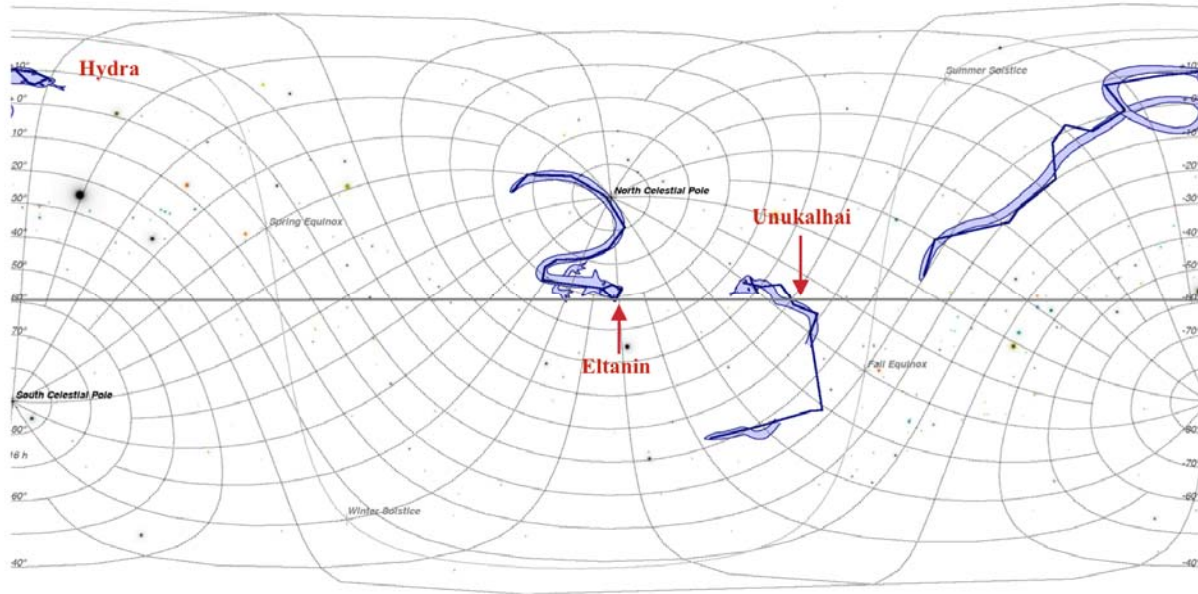



CHART 20. Eltanin Draconis sets and is in its lower culmination, as Unukalhai Serpentis rises, and the head of Hydra is in its upper culmination, representing the *w3dyt*  nome.

Although the serpent is not depicted alongside other circumpolar constellations in astronomical ceilings, perhaps for magical reasons, possible depictions of the stellar serpent can be found in the Amduat, as evidenced in Seti I's tomb, from the eighteenth dynasty, as the protective serpent, Mehen, showing an outline similar to the constellation of Draco (fig. 14). As a circumpolar "imperishable" constellation, Draco, symbolized by the Ureus serpent, was representative of royal power and protection since the constellation "defeated" the horizon every night.



FIGURE 14. Detail of Seti I's tomb.

Draco was an important constellation because its star, Thuban, marked the Celestial North Pole for many centuries during the peak of the ancient Egyptian civilization. Confirming the association of the *w3dyt* nome and Draco is the festival of "The Birth of Apophis," the serpent of chaos feared by the Egyptians. The festival was celebrated on III Peret 22 (February 5), during the time of Aquarius. Until about 2800 BC, as the water-bearer was rising, Thuban was in its lower culmination; and while Aquarius was setting, Thuban was in its upper culmination.

III. The Celestial Boat

The Pyramid Texts of Unas, from circa 2300 BC, record the earliest spells from the Old Kingdom. Inscribed on the walls of his pyramid, they describe the Pharaoh's ascension to the stars after his death on a solar barque:

Become clean: occupy your seat in the Sun's boat and row the above and elevate those who are far off. You should row with the Imperishable Stars, sail with the unwearying ones, and receive the Nightboat's cargo. (J. P. Allen & Der Manuelian, 2005)

The boat was so sacred in the ancient world that, throughout different cultures, it represented a constellation in the starry heavens. The ancient Greeks associated a Southern constellation with a boat, called the *Argo Navis*, named after the story of Jason and the Argonauts (Apollonius & Seaton, 1912). The Babylonians also had a boat constellation called MA.GUR and they had a celebration called the "Festival of the Boat of An." The Chinese had a "Celestial Boat" called *Tianchuan* 天船, which was associated with the Perseus constellation. Early Arab astronomers called one of the stars in the

Southern Phoenix *Nair al-Zaurak*, meaning the "bright one of the boat," since they saw that asterism as a *dhow*, or small boat (R. H. Allen, 1963).

Unlike the Greeks who saw their gods traveling on chariots across the sky, the Egyptian pantheon sailed the heavens on boats. Senmut's New Kingdom astronomical ceiling also depicts a boat constellation surrounded by stars. Plutarch wrote in "De Iside et Osiride":

Thus they say that Osiris was a general, that Canopus, from whom the star took its name, was a pilot, and that the ship which the Greeks call Argo, being made in imitation of the ship of Osiris, was, in honour of him, turned into a constellation and placed near Orion and the Dog-star, the former being sacred to Horus and the latter to Isis (Budge, 1912).

According to Plutarch, the Egyptian constellation of the ship of Osiris inspired the Greek Argo Navis. The Egyptians themselves must also have had a boat constellation, though from the emblems of the nomes it is not immediately clear whether this constellation was the same as the Greek Argo Navis. One festival during the month of II Akhet, when the sun was in Virgo, celebrated the "fixing the front piece of the prow on the Sacred Boat." This celebration could be a result of Virgo rising together with Canopus, the brightest star of Argo Navis.

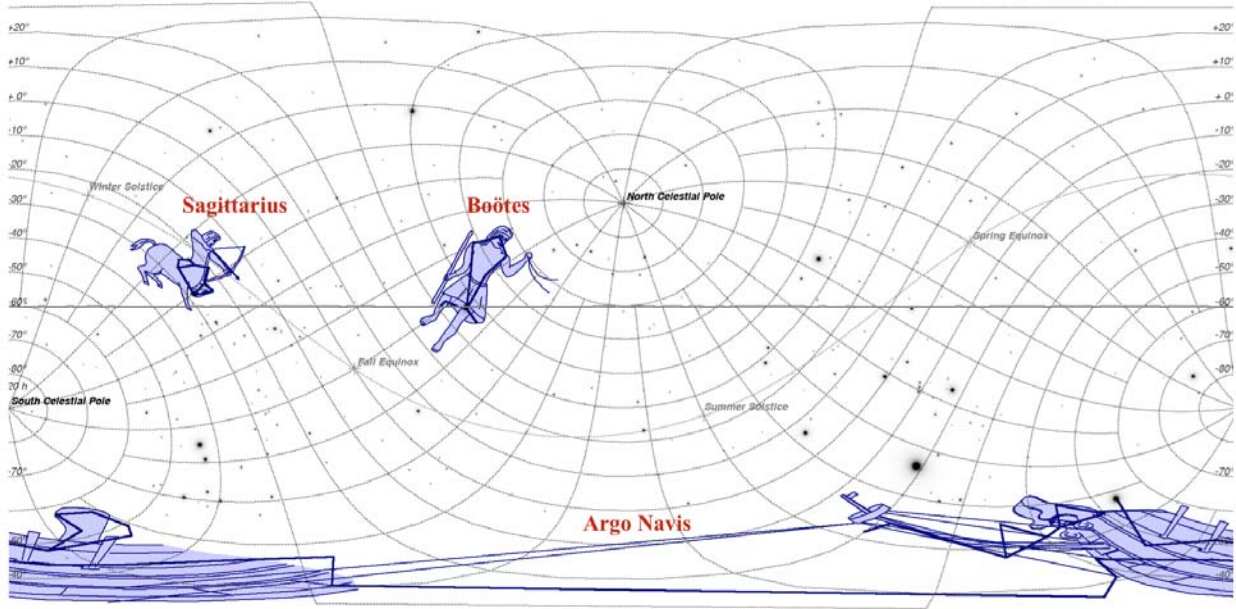


CHART 21. Sagittarius sets with the “hoof” of Boötes, while Argo Navis is in its lower culmination as represented by the boat under the feet of Sagittarius in the Denderah zodiac (fig. 5a).

The Ptolemaic-era zodiac, in the temple of Denderah, shows a small boat below the feet of Sagittarius (fig. 5a). It must correspond to the time at which Sagittarius was setting alongside the “hoof” of Boötes. Meanwhile, the constellation of Argo Navis was in its lower culmination, metaphorically under the feet of the horse (chart 21).

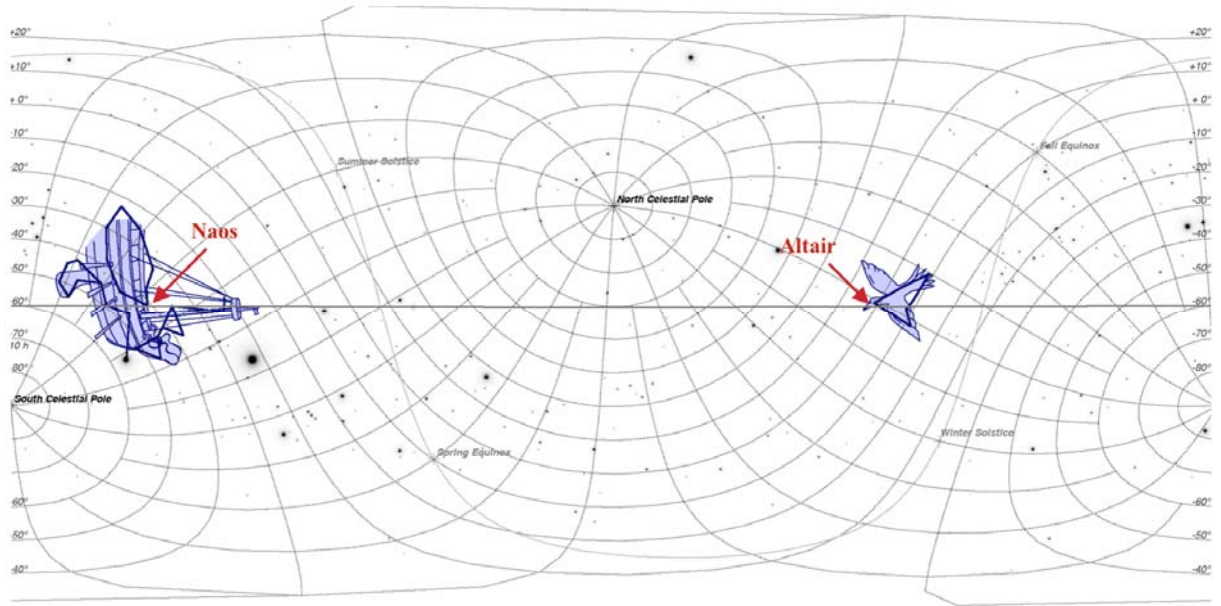









CHART 22. Altair rises opposite the star Naos, the “ship,” representing *nmty* .

The 18th nome of Upper Egypt, *nmty*  was named after the falcon god who is often shown perching on a crescent-shaped barque . In the Coffin Texts, he supervises Sokar’s *hnw*  boat. The brightest star of Aquila, Altair, rises opposite the star Naos, which in Greek means “ship” and which was part of the Argo Navis constellation (chart 22). One of the Egyptian decans is called *ḥr-ib wī*   , “the one in the middle of the ship,” which Conman identified with Altair (Conman, 2006-2009). Belmonte and Lull also proposed that the constellation *dʒt*, “The Ferryboat” was associated with the area of Argo Navis. With this, it is sufficiently clear that parts of the Argo Navis were the celestial boat constellation from ancient Egypt, even if the Greeks did not preserve its original shape.

Conclusion

Given the large number of sequential and precise matches, 38 in total, and their confirmation with various calendrical festivals, it seems more than reasonable to conclude that the nome emblems represented the original ancient Egyptian constellations. Only 5 of the 42 nomes did not present a clear astronomical identification. Also, only 10 out of the 48 classical constellations remain without

probable Egyptian parallels. Thus, we can conclude that the Egyptian night sky was one of the major inspirations for the creation of the classical constellations recorded by Aratus and Ptolemy.

Of the classical zodiacal constellations, the study confirms with a high degree of certainty that at least half of them already existed in early Egypt: the lion of Leo, the scales of Libra, the scorpion of Scorpio, the water-bearer of Aquarius, the fish of Pisces, the bull of Taurus, and the twins of Gemini. Less precise, but nonetheless conclusive, are the identifications of Virgo with the mother goddess and Sagittarius with the bow. Festivals such as the those for the scorpion goddess and Osiris during the month of Scorpio, the birth of Apophis, the serpent deity, when Thuban was in its culmination, or the festivals for Anubis that coincide with the rising of Canis Major, serve to confirm the methodology of the research.

Instead of recording the constellations in lists, like Ptolemy, or in poems, like Aratus, the Egyptians etched their constellations onto the very map of Egypt. Each district was a constellation, and the Nile River was an earthly manifestation of the Milky Way, a celestial river upon which the star gods and the souls of the deceased sailed. Not only does the study show that the Egyptians had many of the same classical constellations as the Greeks and Babylonians, but this new understanding can provide an overarching framework for explaining the origins of the various cult centers throughout Egypt, and also help us better understand the mysteries of the ancient Egyptian star cult. Perhaps now a new meaning may be gleaned from the words ascribed to the Greek sage, Asclepius, in "The Perfect Discourse" when he states that "Egypt is an image of heaven" (Fowden, 1986).

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